MUNICIPAL JOURNAL AND ENGINEER

VOL. XVII NEW YORK, OCTOBER, 1904 No. 4.

MUNICIPAL CONDITIONS IN ST. LOUIS

The City as It Is at Present—The Model Street at the World's Fair—The Cities Represented —Meeting of Municipal Associations.

MUNICIPAL crookedness has been unduly magnified in St. Louis because of the crusade against its boodlers by Circuit Attorney Folk. Judging from the articles in some of the sensational magazines and from many of the newspaper "yarns" traveling about the country one would almost be led to believe that St. Louis held the unenviable position of being the worst administered city in the United States. But that would be far from the truth. The quiet neighborhood of Philadelphia leads the world in civic looting, and there are a number of other American cities worse than St. Louis. The fact that most of the St. Louis boodlers have been arrested, tried and convicted, in itself, is sufficient evidence to prove its inherent probity; this distinction alone places it in the front rank so far as civic stamina, integrity and honesty in the aggregate citizenship is considered. This cannot be said of New York, Philadelphia or Chicago, nor of many smaller cities, for their boodlers go unpunished, though in many instances the public treasury has been robbed almost openly. This much should be said in justice to St. Louis and for the sake of dissipating wrong impressions previously made.

ROLLA WELLS,
Mayor of St. Louis

Under the hopeful influence of Circuit Attorney Folk's vigorous crusade against wrongdoers and with the wise, careful and aggressive administration of Mayor Wells the city has entered upon a new era of prosperity, which, it is to be hoped, will be continued indefinitely under future administrations.

COMPARATIVE CIVIC CONDITIONS

A brief enumeration and comparison of civic conditions and possessions of the three cities, St. Louis, Boston and Baltimore, will not be without interest to MUNICIPAL JOURNAL readers. St. Louis had a population, in 1900, of 575,238; Boson, 560,892; Baltimore, 508,957. The relative area of the three cities is 61.4, 42.6 and 31.6 square miles respectively. Of this area St. Louis has about 450 miles of paved and 425 miles unpaved streets; Boston, about 500 miles of paved and 85 miles unpaved; Baltimore, about 385 miles of paved and 45 miles unpaved. Of the three cities, Boston is undoubtedly the best paved, as it has a larger per cent. of modern pavements in good condition, besides having a smaller amount of streets that are not improved at all. All three cities have a larger per cent. of cobble-stone and granite and Belgian block pavements than they should have. The more progressive cities of England and Europe have long since discarded the rougher class of pavements, and in the last decade have been rapidly substituting the smoother pavements. American cities are slow to imitate the good example of the cities across the Atlantic, but many of them are coming to realize the immediate necessity of not only extending the mileage of smooth pavements, but rooting out the rougher sort by subsituting smooth pavements like brick, bitulithic, creosote and kreodone wood block pavements.

From a sanitary standpoint, Boston takes the lead, which is due, in all probability, to the fact that it has had a longer civic existence, and so an opportunity to perfect itself in this very essential particular, although it has less than 100 miles more of sanitary sewers than St. Louis. As is well known,

Baltimore has been struggling with this question for many years, but from recent events it seems probable that during the next five years it will succeed in substituting a modern sanitary sewer system for its present antiquated surface sewer system.

When it comes to the question of the quality of transportation Boston still leads with its 214 miles of street railways, as compared with 325 in St. Louis and 353 in Baltimore, but when the revenue benefits from the transportation companies of the three cities are compared, Baltimore takes the lead, as its income from the street railway franchises is greater than either of the others. It is interesting to note that although St. Louis and Baltimore have a larger street railway mileage than Boston, the transportation companies of the New England city employ a larger number of men than either of the others.

A curious contrast is noticeable in the equipment and administration of the police department of these three cities. For example, St. Louis has a police department with a total valuation in land, buildings, apparatus, etc., of about $225,000, while Boston has a total valuation of $1,025,000, and Baltimore about $480,000. St. Louis has about 1,264 policemen to Boston's 1,245, and Baltimore's 947. Temperance people generally argue that there is more drunkenness in cities where there is the greatest number of saloons, but this does not seem to be true in these cities, for while St. Louis has 2,260 licensed retail liquor saloons, each of which pays an annual fee of $500, it had in 1902 only 4,068 arrests for drunkenness, as compared with Boston's 990 licensed liquor saloons and 19,511 arrests. The same year Baltimore had 2,100 saloons and 10,225 arrests for drunkenness. The total number of arrests for all offenses in St. Louis, however, aggregated 23,666 in 1902 to Boston's 34,500, and Baltimore's 31,423.

HEALTH AND SANITATION

Dr. John H. Simon, Health Commissioner of St. Louis, reports that the health of the city during the past year has been good.

The ratio of mortality is based upon an estimated population of 670,000. The death rate was 17.14 per thousand against 16.60 the year preceding. The greatest proportion of increase was in measles, there being 125 deaths recorded in 1903-4 against 27 in 1902-3. This is accountable for by the fact that directly after the flood there was an epidemic of measles. A great many adults were attacked, and those from the flooded districts seemed peculiarly susceptible to the disease. In consequence our dispensaries were crowded for months with people with the eruption on them who had come to the city from neighboring States.

There was a tremendous increase in the number of deaths caused by pneumonia; 1,220 persons succumbed to this disease in 1903-4 as against 946 the preceding year. Pneumonia was very prevalent all over the United States during January, February and March, 1904, particularly in the large cities. This is attributable largely to the long and severe winter.

A noticeable increase in the number of suicides and deaths resulting from accidents also served to raise the ratio of mortality. There was a net increase of 35.81 per cent. in the number of suicides, and one of 28.45 per cent. in accidental deaths.

Typhoid fever showed a slight increase also, there being 284 deaths from this disease as compared to 231 the preceding year.

There was but little change in the mortality of tuberculosis, the deaths attributable to this disease being 1,169 against 1,095 in 1902-3.

The proportion of the number of births to that of deaths showed a considerable increase. There were 12,074 births recorded, and 11,486 deaths, a difference of 588 in favor of the birth rate. During the preceding year there were 10,851 births, or 1,223 fewer than in 1903-4. Unfortunately there are physicians and midwives who are remiss in the duty of seeing that the births of children delivered by them are duly placed on record. On the other hand the death record is accurate, so it would appear that there is an even larger percentage of births over deaths than the statistics show on their face.

The general sanitary condition of the city has been greatly improved. The credit for this condition is due in a large measure, though not entirely, to the increase in paved streets and alleys, and the construction of sewers in outlying districts. The filling up of ponds in every quarter of the city under the supervision of the chief sanitary officer; a careful and systematic inspection of dairies in the city limits and a firm insistence upon improvements in the methods of operating them; the rigid enforcement of the law requiring the abatement of such nuisances as ash heaps, manure piles, and other foci of disease; the care exercised to promote the sanitary welfare of the residents of the tenement districts; the untiring efforts of the Department Officials to keep the city clean have had their inevitable effect in suppressing disease at this most critical period.

The amount appropriated for the Health Department for the fiscal year 1903-4, was $736,339.97; the amount expended by the Health Department for the fiscal year 1903-4, was $690,129.33; and the amount turned over to Municipal Revenue for the fiscal year 1903-4, was $46,310.64.

THE PARKS OF ST. LOUIS

The Park Commissioner of St. Louis, Hon. Franklin L. Ridgley, in his report for 1902-1903, calls attention to the encroachments of the Louisiana Purchase Exposition upon the western half of Forest Park and the report of Mr. Samuel Parsons, Sr., Engineer and Landscape Architect of the Park System of Greater New York, whose services were secured in the matter. Mr. Parsons reported that it would require not less than $650,000 to restore the park scenery after the Fair has been cleared away. It was voted by the Park Board to require an additional bond in the sum of $550,000 to the $100,000 already furnished by the Exposition Company.

In Mr. Parsons report he says:

The most serious and regrettable loss caused by the preparation of the Fair grounds is the trees. It is easy to judge that the trees which were destroyed were invaluable, and, from the park point of view, unreplaceable. It is said that over 12,000 trees of all sizes have been cut; and at least

6,000 of them were of large size. It is evident that native trees, oaks, maples, chestnuts and birches of this large growth, cannot be replaced as soon as the Fair is over, certainly not in less than twenty years; indeed, they may never again be grown in their original beauty. Nor will the myriad shrubs which the Fair will leave behind free from its transitory embellishment, even in a small degree, make up for the loss of these beautiful native trees.

The importance to the City of St. Louis of this provision of a sufficient bond to secure the restoration of the Fair grounds to good park territory becomes even greater in light of the fact that several of the Worlds' Fairs have left the parks of their respective cities in a deplorable condition.

St. Louis has 2,183.39 acres of parks, valued at $22,153,000, as against Boston's $2,620.00 acres, valued at $7,936,884, and Baltimore with 1,284.34 acres, valued at $3,829,312.

Civic Improvement League

The Civic Improvement League of St. Louis is designed to unite the efforts of all citizens who want to make St. Louis a better place to live in, and every citizen is asked to become a member. Its general purposes are to create a public sentiment in favor of better administration of municipal affairs, without in any way invading the domain of politics. The League will work for a strict enforcement of all the ordinances now existing that are designed to make the city clean, healthy and attractive. It will work for the enactment of such other ordinances as may be needed to improve the city's appearance. The League's purposes are not chiefly aesthetic, though they all lie in the direction of cultivating a taste for municipal beauty. The League intends to carry on a continuous campaign among the people, by lectures to the school children, and before social and fraternal organizations of all sorts, in which the advantages of a finer city will be brought home to all.

St. Louis has just secured its first municipal playground. To St. Louis it means much for it commits the city to the policy of establishing down-town parks in the crowded tenement districts. This new municipal playground is the result of the active campaign which the Civic Improvement League of St. Louis has been carrying on. Three years ago the League established six model playgrounds in the tenement districts. An ordinance was prepared under the direction of the League and introduced into the Municipal Assembly providing for the appointment of a Municipal Bath and Playground Commission, the members on this Commision to serve without pay. This Commission has been appointed from the members of the Civic Improvement League's Committees.

The Bill providing for the playground was also prepared by the League and was pased by the Municipal Assembly. The League had shown the practical side of this work and carried it on so successfully, that the city officials readily took up with the idea.

In St. Louis the Civic League organized clubs in the neighborhood of the playgrounds and these clubs practically managed the playgrounds. The direct result has been that the people have not only come to wanting the playgrounds but it is developing in them a spirit of civic pride, and in the neighborhood of the Mullanphy Playground, which is the one the city has just taken over, a great demand for the pavement of streets has started. It has also been the means of inciting the people to wanting better school facilities. The School Board has met this cry by purchasing a large area of ground for the purpose of building a model school in this tenement district.

MODEL STREET AT WORLD'S FAIR

Not at All Comprehensive, But Affords City Officials Chance to Learn Something—Exhibits of Cities Most Imposing.

The idea of a model city for the World's Fair was first suggested by the editor of the Municipal Journal, prior to the Pan-American Exposition. He put forth the suggestion that an exhibition of a model city be made a feature of the Fair at Buffalo and discussed the matter in detail with the mayor and members of the executive committee of that Exposition at its inception. Theodore Roosevelt, then governor of New York, in his annual message to the Legislature referred to the matter favorably and recommended that an appropriation be made for the purpose. The "Black Horse Cavalry" of the Legislature, however, did not "see anything in it" for them, and the result was that no appropriation was made.

Origin of the idea

At the time of the inception of the Louisiana Purchase Exposition, the editor of this journal placed before Governor Francis the data that had been gathered for and discussed in Buffalo, so that there might be plenty of time to exploit the idea on broad and rational lines. Two years later the Municipal Art Society of New York urged upon the projectors the value of having a model city at St. Louis, offered to assist in the appointment of a suitable commission and submitted a preliminary plan. At its own expense it sent a committee to St. Louis to consult about the matter and suggest plans. Their proposals were ignored by the Exposition managers who, however, took up the idea to the extent that they commissioned Mr. Albert Kelsey of Philadelphia—who had been included in the personnel of the Municipal Art Society committee—to plan and build the so-called model city. In doing so they made the fatal mistake that any one man, however able, could successfully carry out so expansive a proposition.

Original Idea Dwarfed Beyond Recognition

As the work progresed, the managers of the Exposition failed to allow the carrying out of even the contracted plans and purposes of Mr. Kelsey, the result being that that gentleman severed his connection with the enterprise.

Officers of the League of American Municipalities

Reading from left to right: Former Mayor J. M. Head, Nashville, Tenn., President; Mayor William C. Crolius, Joliet, Ill., First Vice-President; Mayor William C. Maybury, Detroit, Mich., Second Vice-President; Former Mayor I. A. Sullivan, Hartford, Conn., Third Vice-President; Former Mayor John MacVicar, Des Moines, Ia., Secretary; Mayor William D. Morgan, Georgetown, S. C., Treasurer.

The deplorable result is that there is at St. Louis no model city worthy of the name, nor does the inadequate exhibit now to be seen there measure up even to its present designation of a "Model Street."

In order that no injustice shall be done to such municipal ideals in public improvements as are expressed in practical creation on the Model Street at the World's Fair, a brief description of what has been accomplished there is herewith submitted:

The Model Street is 1,200 feet in length, and has a roadway 42 feet wide, with grass lawns and trees on each side between the roadway and the ten-foot sidewalks.

The paving of the roadway illustrates some of the ideals realized along particular lines by advanced cities of the world. Features of various cities are embodied in the street itself and in the various buildings situated thereon.

According to the Exposition authorities leading cities throughout the world were requested to make comparative exhibits by contributing features illustrating important phases of their municipal development. The aim was to create a practical, suggestive exhibition of street equipment and city constructive arrangement, in which every feature should be planned with reference to its relation to the community and its general fitness and beauty.

This street, which is about the length of four ordinary city blocks, is paved with different materials, one section of it being asphaltum, bituminous macadam, another brick, another concrete and another concrete with water-proof surface. The street is guttered and fitted with sewers, tunnels and conduits for gas and water pipes and all kinds of wires and other underground conveniences.

BUILDINGS OF SEVERAL CITIES

The cities represented by buildings on the Model Street are New York, Kansas City, San Francisco, Minneapolis, and St. Paul. There is a building known as Guild Hall, devoted to education. Another, called the Town Hall, is devoted to municipal affairs, the leading exhibits being those of Boston, Mass., and Buffalo, N. Y. A city park is located between Guild Hall and a model playground and day nursery and a model hospital just beyond the nursery complete the public buildings on the Model Street. The other buildings being restaurants, bank and other business houses.

The Kansas City Casino building, occupying a prominent position at the north end of the Model Street, is one of the most attractive. It is 165 feet with two wings enclosing an open colonnade.

The sum of $26,000 was appropriated by the Missouri Commission out of the State fund to erect the building and supply the mural decorations and the maps. A similar amount was pledged by the Kansas City committee, made up from members of the four civic organizations of the city —the Manufacturers Association, the Commercial Club, the Real Estate Exchange and the Live Stock Exchange.

The north wing of the Casino is used as a general assembly room. Its frieze, eight feet high is made of mural decorations, scenes of parks, boulevards and various points of interest in the city. A large map of the United States 22 by 28 feet, occupies a prominent position on the south wall of this room, showing the geographical location of Kansas City and the various centers of agricultural and mineral products of the country. On this map are presented statistics of the city, showing the acreage of parks, the number of schools, bank clearings and deposits, population and the natural resources of the territory tributary to Kansas City.

The south wing is devoted to public comfort rooms. The west side, which is the ladies' room, is furnished with the comforts dear to woman's heart. The corresponding room, occupying the east side, is for gentlemen.

In the center of the open colonnade on a raised platform is a large relief map of Kansas City, 13½ feet by 14½ feet. The promenade around this map and colonnade is relieved by palms and flowers.

SAN FRANCISCO BUILDING

The San Francisco building is a model of the San Francisco Ferry Depot, which is appropriate, as the shipping facilities are one of the special features of the exhibit.

A complete municipal exhibit of all the departments of the city government, which shows the workings of the departments of education, health, streets, fire, police and public parks, occupies the greater portion of the second floor.

The organization of committees for the San Francisco Exhibit was effected jointly by the five leading commercial organizations of San Francisco—Merchants' Association, Merchants' Exchange, Manufacturers' and Producers' Association, Board of Trade of San Francisco, and Chamber of Commerce.

A hemisphere eight feet in diameter at the equatorial line serves to illustrate San Francisco's railroad and steamship connections, and a relief map showing the contour and elevation of land surrounding the bay, from Benicia to San Jose, can be studied by interested visitors.

These are supplemented by a set of enlarged panoramic

views of the bay, and motion pictures of the entire water front, showing the shipping coming and going, with special reference to the ferry system. These are reinforced by charts, maps and models of the street railway lines, also water, light, and telephone service, street paving and sewer system.

Lectures illustrated by lantern slides and moving pictures of places in San Francisco are given daily in the lecture hall in the rear of the main exhibits. A sunshine argument is made with a set of enlarged colored photographs of the market stalls at Christmas time. A photographic exhibit of flower venders in midwinter, with varieties of flowers grown in the open air, is shown; also motion pictures of the Olympic Club swimming in the surf at the Cliff House beach on Christmas day, as well as views taken in Golden Gate Park, including the music stand, children's paygrounds, etc., taken at the same season. The official weather bureau records form a part of this exhibit.

The United Crafts and Arts have furnished the building throughout with specially designed furniture made from California Curly Redwood and Redwood Burl. All the furniture is in old mission style, and is in harmony with the building it furnishes.

Building of the Twin Cities

St. Paul and Minneapolis, the Twin Cities of the Northwest, are represented on the Model Street by a Municipal Museum, erected and maintained at the joint expense of the two cities. The exhibit represents a purely municipal movement, $12,500 for each city being appropriated by the respective city councils. Loans of exhibits by private citizens will bring the amount represented up to $35,000.

The primary purpose of the exhibit is to show the municipal progress made by these two cities, and incidentally to teach the older cities that the movement toward municipal and industrial betterment was not to be measured by length of years.

The New York City building, which commands the entrance to the Model City, with its numerous municipal exhibits at the World's Fair. The building in its design is suggestive of the City Hall in Greater New York, and since its formal opening has been crowded daily by visitors from all over the world, whose opinions of the exhibits has been sounded in words of commendation subscribed by them after their signatures in the register book.

Among the exhibits in the New York City building is the topographical map of Greater New York, which was shown at the Paris Exposition and won several medals. Two aluminum models of the Brooklyn and Williamsburg bridges with two cross sections of the powerful cables that support those immense structures adorn each side of the big map.

The Department of Street Cleaning of New York is represented on a large and attractive scale. One of its great attractions is a working model of an incinerating plant in use at the foot of 47th street and the Hudson River. This model, with all its machinery in motion, shows how all dry refuse is disposed of with profit to the metropolis of $130,000 a year, besides obtaining light and heat from the plant, and several of the department buildings in the immediate neighborhood. There is also a model of an incinerator for the reduction of garbage.

Another New York City exhibit is a model of some of New York's great public buildings.

The Aqueduct and Water Supply Departments give a very large exhibit as to how the people of the city obtain their supply of water. The New York City building is in charge of Hon. Thomas W. Hynes, commissioner, representing the American metropolis.

CONVENTION OF THE AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS

The eleventh annual convention of the American Society of Municipal Improvements will be held in St. Louis, October 4, 5 and 6. The convention of the League of American Municipalities is to be held in the same city simultaneously and a full programme of its proceedings appeared in the Municipal Journal for September. The president of the former society, Mr. George M. Ballard of Newark, N. J., and Secretary George W. Tillson, of Brooklyn, N. Y., have notified the members that the headquarters and place of meeting at St. Louis will be located at the Grand View Fraternal Hotel, corner of Oakland and Clayton avenues. To reach the hotel delegates to the convention will take the Market street car from Union Station.

The program of the convention is as follows:

Program of Convention

First Day, Tuesday, October 4, 1904

10 A. M.—Meeting of the Executive Committee at Convention Headquarters.

Officers of the American Society of Municipal Improvements

Reading from left to right: G. M. Ballard, Newark, N. J., President; A. P. Folwell, Easton, Pa., First Vice-President; C. C. Brown, Indianapolis, Ind., Second Vice-President; W. B. Howe, Concord, N. H., Third Vice-President; G. W. Tillson, Brooklyn, N. Y., Secretary; F. J. O'Brien, Oswego, N. Y., Treasurer.

10 A. M. to 12 M.—Delegates will report at the headquarters for registration, badges, credentials, etc.

AFTERNOON SESSION, 2 P. M., AT HEADQUARTERS, GRAND VIEW FRATERNAL HOTEL.

Regular order of business:

1. Roll call.
2. Reading of minutes of last meeting.
3. Consideration of Applications for membership.
4. Address by the President.
5. Reports of the Secretary and Treasurer.
6. Report of the Executive Committee.
7. Report of the Finance Committee.
8. Miscellaneous business.

Report of Committe on Municipal Data and Statistics, Wm. Fortune, Chairman, Indianapolis, Ind.

Report of Committee on Municipal Franchises, Emmet Steece, Chairman, Burlington, Ia.

Report of Committee on Taxation and Assessment, C. H. Rust, Chairman, Toronto, Canada.

Paper on "Taxation and Assessment," C. H. Rust.

Paper on same subject, Fred J. Kern, Belleville, Ill.

Paper on "The Influence of Citizens' Associations on Public Improvements," Chas. C. Brown, Indianapolis.

EVENING SESSION, TUESDAY, OCTOBER 4, 8 P. M.

Paper on "The Pollution of the Passaic River" (a stream in the eastern part of New Jersey), Earnest Adam, Newark, N. J.

Report of Committee on City Government and Legislation, John Rowson, Chairman, Grand Rapids, Mich.

Report of Committee on Park Development and Maintenance, G. A. Parker, chairman, Hartford, Conn.

Paper on same subject, G. A. Parker.

Paper on "The Sewerage System of Little Rock, Ark.," Walter F. Reichardt, Little Rock, Ark.

Report of Committee on Disposition of Garbage and Street Cleaning, John Jones, Toronto, Canada, chairman.

SECOND DAY, WEDNESDAY, OCTOBER 5, MORNING SESSION 9:30 SHARP

Report of Committee on Review, George H. Benzenberg, chairman, Milwaukee, Wis.

Report of Committee on Electric Street Lighting, E. A. Fisher, chairman, Rochester, N. Y.

Paper on same subject, by E. A. Fisher.

Paper, F. A. Kummer, New York, "The Testing of Wood Paving Blocks."

Paper, W. H. Broadhurst, Brooklyn, N. Y., "A Municipal Laboratory for Testing Asphalt and Cement."

Paper on "Losses in Underground Municipal Structures," A. Prescott Folwell, First Vice-President, Easton, Pa.

Report of Committee on Water Works and Water Supply, T. Chalkley Hatton, Chairman, Wilmington, Del.

Paper on "Municipal Ownership of Water Supply," T. Chalkley Hatton.

Paper by Ernest G. Barrow, Hamilton, Canada, "The Desirability of Metering Both Domestic and Fire Service in Large Establishments."

THIRD DAY, THURSDAY, OCTOBER 6, MORNING SESSION, 9:30 SHARP

Report of Committee on Street Paving, C. D. Pollock, Chairman, Brooklyn, N. Y.

Paper on same subject by C. D. Pollock.

Paper, Fred J. Warren, Boston, Mass., "The Bitulithic Pavement, Its Strong and Its Weak Points."

Paper on "Pavement Specifications," Major J. W. Howard, Consulting Engineer, New York.

Report of Committee on Sewerage and Sanitation, Ernest Adam, chairman, Newark, N. J.

Paper on same subject, Newton J. Ker, Ottawa, Canada.

Paper, "Sewage Disposal," John N. McClintock, Boston, Mass.

Paper, "The Use of Sulphur for Sewer Pipe Joints in Wet Trenches," E. S. Rankin, Newark, N. J.

Paper, H. N. Ruttan, Winnipeg, "The Municipal Asphalt Plant of Winnipeg."

A PARTIAL VIEW OF THE MODEL STREET, AT WORLD'S FAIR, ST. LOUIS.

PORTLAND CEMENT*

Its Uses in Various Engineering Constructions—The Setting and Hardening of Cement and Mortar

By E. Kuichling, C. E.†

In the preceding number of the MUNICIPAL JOURNAL AND ENGINEER, the subject of the phenomena which occur when cement is mixed with water was introduced by an account of the heat developed by such mixture, and its relation to the quality of the material. In the present number the subject is continued by a statement of the chemical and physical reactions involved in the process of hydration.

THE SETTING AND HARDENING OF CEMENT

For more than 2,000 years hydraulic mortars, formed essentially of lime mixed with clayey matter, have been used in important constructions, but the processes which take place in their formation and subsequent hardening do not appear to have been definitely determined. The reason for this lack of knowledge is due to the numerous difficulties which attend the chemical and physical investigation of the material, as has already been pointed out. Some consider the hardening of cement as a process of crystallization according to strict chemical combinations, while others regard it as an almost purely physical process without the formation of crystals, and assume the existence of a colloidal compound varying in composition within wide limits. The first class of authorities is represented by Le Chatelier, and the second by Michaelis.

Common lime mortar is essentially a mixture of hydrate of lime with three to four times its weight of sand, and its hardening is generally attributed to the gradual conversion of the lime into calcic carbonate by the absorption of carbonic acid from the atmosphere. This absorption is rapid in the outset, but it gradually becomes slower and finally ceases. Mortars that are centuries old are said to still contain appreciable quantities of hydrate of lime. Some chemists assert that the hardening may also be due to the formation of a calcic silicate by the gradual combination of a part of the lime with a part of the silica of the sand. Thus Petzholt found that in mortar 100 years old there was more soluble silica than in the original lime, and that in mortar 300 years old there was three times as much soluble silica as in mortar 100 years old.

While these statements may be accepted, yet they do not serve to explain the rapid solidification of hydraulic cements within the period of setting. It has been shown previously that Portland cement is of very complex and variable constitution, and that its essential components are unstable in the presence of water. Owing to variability of composition, such cement differs widely in its rate and manner of setting. Some cements require but a few minutes for the completion of this initial process, while others remain for several hours in an apparently inert condition and then set very quickly. To find a satisfactory explanation for these varying actions, an intimate knowledge of the behavior of the different constituents when brought into contact with water should first be acquired. An abstract of the available data in this respect was given on pages 67 and 68 of the current volume, and an extension thereof will be found in the following paragraphs.

DISTINCTION BETWEEN SETTING AND HARDENING

The solidification of a hydraulic cement or mortar which has been prepared in a plastic state by mixture with water, is usually divided into two stages, the first being called the setting, and the second the hardening stage. From a chemical point of view, the distinction between them is not sharply defined, as the setting can be considered as being only the beginning of the hardening process; but inasmuch as good Portland cements may not attain their ultimate hardness for years, the term "setting" has come to be applied to the first stage alone. This stage is characterized by a progressive diminution of the plasticity of the mixture, until it attains a certain degree of coherence or consistence wherein it resists indentation by the pressure of the finger-nail, or more specifically by the end of a steel wire of particular size, cut off squarely and loaded so as to have a particular weight.

A wire of this kind was first used by Vicat in his investigations of cements, and the instrument has since been called "Vicat's needle." In French and German practice, the wire has at its end a diameter of 1.13 millimeters (0.0444 or 2/45 inch), corresponding to an area of 1.00 square millimeter (0.00155 square inch), and is loaded to weigh 300 grams (10.6 ounces avoird.), while in English practice the wire is 1/10-inch in diameter loaded to weigh three pounds, and in American practice it is 1/24-inch in diameter loaded to weigh one pound. The indentation tests with these wires refer to the end of the setting process, or what is called "hard set," and to fix a beginning therefor, or what is called the "initial set," various larger wires with much lighter weights are sometimes used.

The chemical reactions in the setting of Portland cement are somewhat different from those which occur in the subsequent hardening. According to Le Chatelier, Newberry, Richardson and other authorities, such cement in its unhydrated state consists principally of tri-calcic silicate, with various calcic aluminates, ferrites and sulphate, also some caustic lime, magnesia and alkalies, as accessory ingredients. These latter have all a stronger affinity for water than the tri-calcic silicate, and in their finely divided state become hydrated very quickly, whereas the decomposition of the unstable tri-calcic silicate into the stable mono-calcic silicate and hydrate of lime proceeds comparatively slowly, since it is active only on the surface of the particles and the products serve as a kind of protective coating to the remainder of the

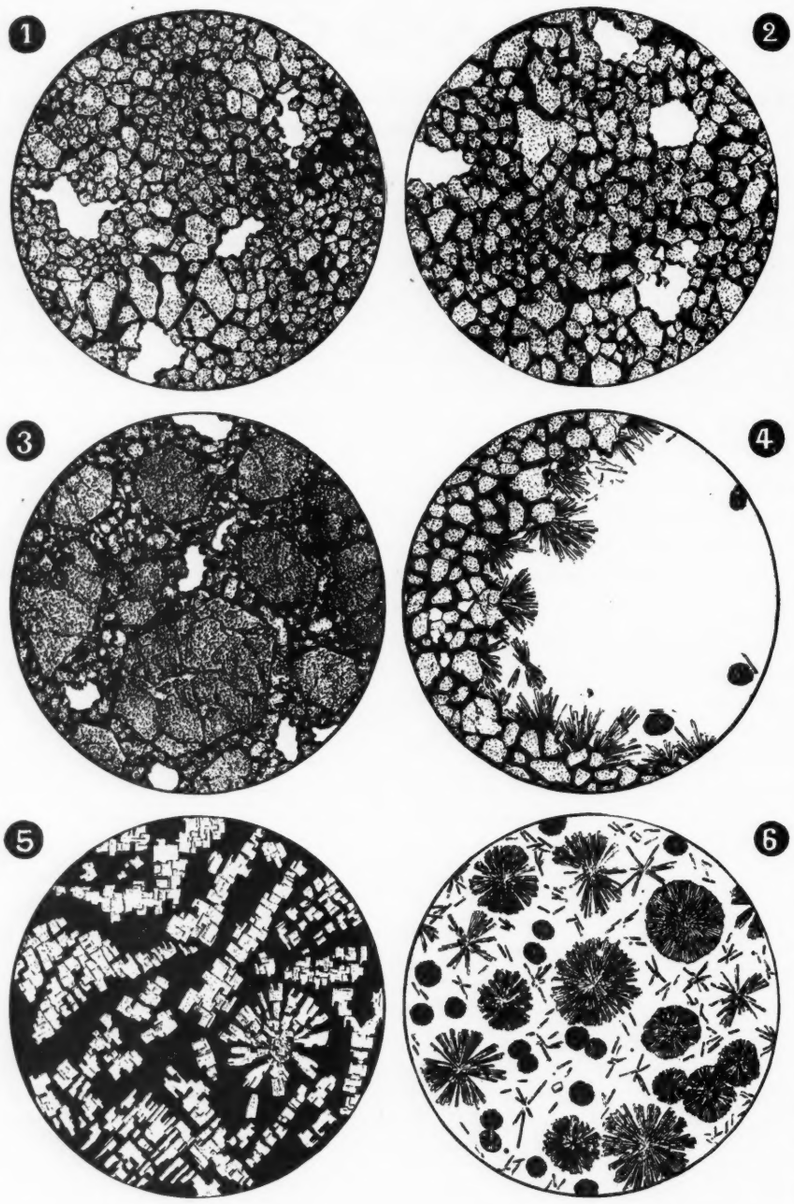
LE CHATELIER'S THEORY OF CRYSTALLIZATION

Several references to the process of hydration and induration as conceived by various authorities have already been made, but as it may be of interest to know something more

* Copyright, 1904, by The Municipal Journal Publishing Co.
† Engineering editor, MUNICIPAL JOURNAL AND ENGINEER.

of Le Chatelier's views of the subject, the following paragraphs have been translated from the second edition of his work entitled "Recherches Experimentales sur la Constitution des Mortiers Hydrauliques," Paris, 1904.

In all known cases of crystallization of salts in contact with water, the formation of crystals is preceded by the solution of the salt. This gives the molecules the necessary mobility to allow them to arrange themselves in geometrical order. There is no instance of solid bodies asuming a crystalline form without a change of state. It is therefore probable *a priori* that the crystallization of plaster of Paris and hydraulic cements is due to the same mechanism or process, otherwise an intermediate state must necessarily exist in which the molecules have a mobility analogous to that which is attained by solution.



The difficulty of admitting that the crystallization of plaster of Paris is preceded by its solution, arises from the fact that the quantity of free water contained in the plastic mass is only about 50 per cent. of the weight of the dry powder, and that this quantity is only enough to dissolve 1/1000 of the quantity of sulphate of lime with which it is mixed; furthermore, the reason is not apparent why this salt, after being once dissolved, should be precipitated and thus allow the water to dissolve another portion.

Fig. 1. A thin section of a gray "grappier" of Teil hydraulic lime, showing crystals of tri-calcic silicate separated by a small quantity of ferruginous filling material.

Fig. 2. A thin section of Boulogne Portland cement clinker, showing the same crystals of tri-calcic silicate which appear in the "grappier" of Teil hydraulic lime, and a much more abundant ferruginous filling material.

Fig. 3. A thin section of cement clinker similar to that of Fig. 2, in which some of the crystals of tri-calcic silicate have attained an exceptional development.

Fig. 4. View showing the beginning of the hydration of a Portland cement. This exhibits the small elongated crystals of hydrated mono-calcic silicate (Cao, SiO_2, $2.5H_2O$), but their size has here been exaggerated nearly ten-fold for the purpose of making the outlines distinct.

Fig. 5. Crystals of tri-calcic di-aluminate ($3CaO$, $2Al_2O_3$) made synthetically.

Fig. 6. A crystallized precipitate of hydrated basic aluminate of lime ($4CaO$, Al_2O_3, $12H_2O$).

This difficulty is easily removed by considering the following experiment of Marignac. By agitating burnt gypsum about five minutes with a certain quantity of water and then filtering the liquid, he obtained a more concentrated solution of sulphate of lime than with the hydrated material. The solution, however, soon deposited crystals of gypsum and returned after a time to its normal concentration. A saturated solution of dehydrated sulphate of lime therefore becomes supersaturated relatively to the hydrated sulphate.

The mechanism of the crystallization of plaster of Paris while setting is accordingly as follows: The burnt plaster becomes hydrated on coming in contact with the water, and gives a solution which soon allows hydrated sulphate of lime to crystallize out of it, leaving it capable of dissolving another quantity of hydrated sulphate; and this process continues until all of the material is fully hydrated and crystallized. These two contrary actions actually take place simultaneously at neighboring points in the mass, and the continual solution of fresh quantities of the substance balances the impoverishment of the liquid resulting from the equally continual deposit of hydrated crystals. The degree of saturation at which the liquid is maintained depends on the relative rapidity of the two opposing actions. If the hydration is very slow, the supersaturation is slight, and vice versa.

If this explanation is correct, then the points where the hydrated crystals are deposited are not necessarily the same as those which were occupied by the particles of material before their solution. This statement is confirmed on following the hydration under the microscope, when large spicules will be seen to have formed in spaces previously filled with water alone. To demonstrate incontestibly the momentary solution of the whole of the sulphate of lime, it would be necessary to produce the crystallization entirely apart from a mass of setting plaster. Le Chatelier was unable to accom-

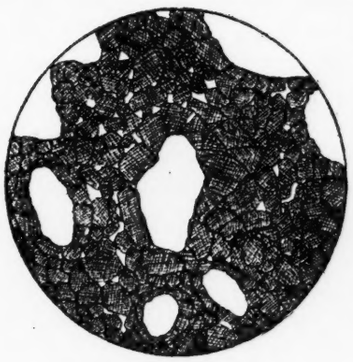


FIG. 7.

plish this with gypsum, but succeeded with anhydrous sulphate of soda, which is much more soluble and sets on contact with water; hence he concluded that the crystallization of the gypsum proceeded from a supersaturated solution in like manner. He also states that the same process takes place with barium silicate and the various calcic aluminates that figure in the setting of cements, as well as with a number of other substances.

From these observations Le Chatelier concludes that "it is well established that the crystallization which accompanies

FIG. 8.

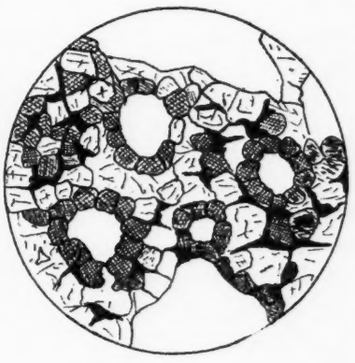


FIG. 9.

the hardening of mortars, results from the difference in solubility of the substances which set and of those which are formed during the set, the former being in a state of unstable equilibrim in the presence of water and incapable of continuing therein longer than momentarily."

Furthermore, supersaturated solutions play another part in the phenomena of hardening by affecting the form of the crystals which are precipitated therefrom. In such solutions these crystals very often develop abnormally in one direction, and assume the form of long and extremely slender prisms or threads, whose length may exceed 100 times the thickness. This happens with the crystals of acetate, sulphate and hyposulphite of soda formed from supersaturated solutions, while from normal solutions the crystals are developed equally in all directions. These slender prisms do not remain isolated, but assemble around a central point and unite at one of the ends, while the other ends form an approximately spherical surface which is maintained during the crystallization.

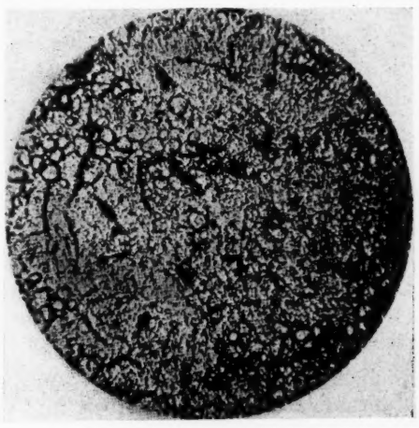


FIG. 10.

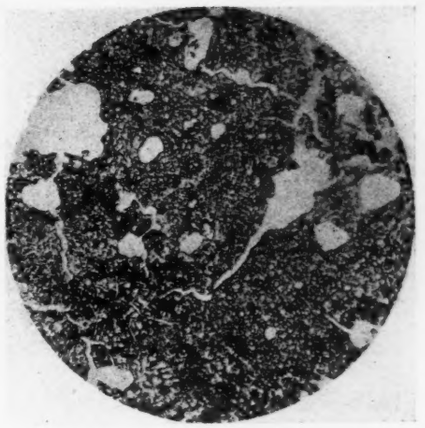


FIG. 11.

These crystals which are formed during the setting of mortars always exhibit a similar spherical grouping, but they are often so slender that the highest magnifying power of the microscope must be used to distinguish them. In plaster of Paris, for example, under normal conditions of setting, the crystallization is hardly discernible; and to render it plainly visible the material must be mixed with alcohol and water, whereby the hydration is retarded and the crystals develop to larger size. On the other hand, the double sulphate of lime and potash forms groupings nearly one centimeter in diameter, and each crystal can be seen with the naked eye. "Hence the crystals which are formed during the hardening are frequently, if not always, extremely slender or attenuated prisms which are united at one end to a central point so as to form a small spherical groupings."

The solubility of substances that harden in contact with water, obviously affects the rapidity of the crystallization and consequently also that of the setting. The relatively soluble sulphate of lime sets quicker than the silicate of lime. In general, if the solubility of such substances is increased by adding certain other substances to the water used in mixing, the setting will be accelerated. Thus,

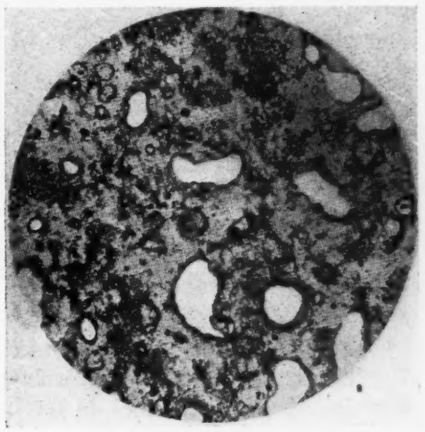


FIG. 12.

Fig. 7. A thin section of clinker of di-calcic silicate, produced synthetically by burning until the mass became plastic. Composition: CaO, 62.20; SiO_2, 34.98; Al_2O_3, 1.70, and MgO, 1.60 per cent. Magnified 250 diameters.

Fig. 8. A thin section of a very porous clinker of Portland cement. The unshaded portions are alit; the shaded portions are belit, and the dark parts are the magma celit.

Fig. 9. A thin section of porous cement clinker showing some of the alit (unshaded) in the form of fairly well-developed crystals, with the belit (shaded) appearing in characteristic form as in Fig. 8.

Fig. 10. A thin section of a synthetic clinker made by Richardson from pure chemicals, and free from magnesia, iron, alkalies and sulphates, but somewhat deficient in lime, showing the globular appearance of belit. Magnified 50 diameters.

Fig. 11. A thin section of a normal cement clinker, magnified 50 diameters. (Richardson).

Fig. 12. A thin section of a normal cement clinker, magnified 50 diameters. (Richardson).

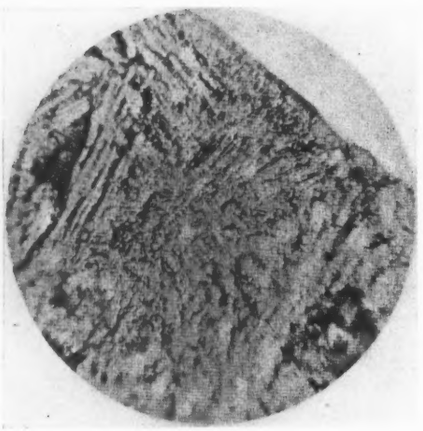


FIG. 13.

plaster of Paris mixed with pure water sets in fifteen minutes; but by adding 1 per cent. of hyposulphite of soda to the water, the solubility of the sulphate of lime is increased and the plaster will set in eleven minutes; and by adding 3 per cent. it will set in eight minutes.

MECHANICAL PHENOMENA OF HARDENING

In studying the mechanical phenomena of the hardening of cements and mortars in connection with those of crystallization, Le Chatelier proceeded on the assumption that the process was not unique, but was similar to, and perhaps even identical with some one of the known modes of induration. All of these modes, viz: hardening by the compression of a pulverized material, by the drying of a moist powder like clay or of a colloidal substance like gelatine, by fusion and solidification, as in the case of metals, and by the crystallization of soluble salts, may be reduced to two more general and simple phenomena, the first being the mutual *adhesion* of the solid particles, and the second being the *mobility* of these particles.

In regard to the latter, enough has already been said in connection with the mechanism of crystallization, as the momentary solution of the substance obviously furnishes the required mobility. After the solid particles have been brought close together by some agency in combination with mobility, the hardness of the mass will depend on both the internal cohesion of the crystals and their mutual adhesion. Of these, the former varies within wide limits, and is a property of matter about which little further can be said; and the same is also true of the extremely complex phenomenon of adhesion, whose variations account for the great differences which are often observed in the strength of similar mortars, as will be seen subsequently.

FIG. 14.

After a briquette of Portland cement has hardened for several months under water, it presents a plainly crystalline structure. With a magnifying glass, small crystals shaped like thin hexagonal plates or scales can be seen in all the cavities. The surface of the briquette is covered with such crystals when the hardening takes place without exposure to the carbonic acid of the air. Cut into thin sections and examined with polarized light, such cement exhibits very transparent spots displaying brilliant colors, and it is clear that these spots are formed by the continuation of the hexagonal crystals which cover the briquette.

Besides these isolated transparent spots, a scarcely translucent whitish mass is seen which shows no apparent evidence of crystallization. This negative character, however, does not prove the absence of crystallization, as it is known that hydrated plaster of Paris, which presents the same appearance, is formed of an entangled mass of long, crystallized needles or spicules of gypsum. These crystals are very slender, and a great many of them, superposed and pointing in all directions, constitute the mass of a thin section of such plaster. The same is the case with cement, as will be seen presently. Scattered about in this whitish mass, the outlines or skeletons of relatively coarse grains of cement are also seen, these being recognized by the ferruginous flux which does not undergo much change, and which is able to preserve the original shape of the crystals of calcic silicate that have been entirely transformed or decomposed.

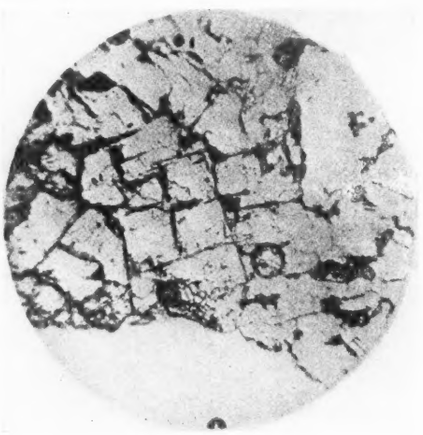


FIG. 15.

The hexagonal scales covering the surface of the briquette sometimes attain a size of several millimeters, and can then be easily detached and studied. In the direction of their axes, these scales exhibit a slight and irregular double refraction, with no direction of extinguishment of the light. In converging light, however, a dark cross is plainly seen, thus indicating that they are negative and uni-axial crystals. On analyzing different quantities of these scales, varying from 0.062 to 0.243 grams, it was found that their average composition was 69.85 per cent. lime (CaO), 22.88 per cent. water (H_2O), and 7.27 per cent. silica (SiO_2).

It is thus seen that these scales consist of hydrate of lime contaminated by a little silica, and that the presence of the latter imparts to the crystals the property of exhibiting feeble double refraction in the axial direction, which is not the case with pure hydrate of lime. The manner in which the crystalline spots are scattered about in the mass of the cement and their lack of crystalline outlines, show plainly that in the process of crystallization the hydrate of lime envelops and binds together all the foreign substances which it embraces, in the same way as the carbonate of lime in Fon-

Fig. 13. A thin section of fused tri-calcic silicate, magnified 250 diameters. (Richardson).

Fig. 14. A thin section of fused di-calcic silicate. Magnified 250 diameters. (Richardson).

Fig. 15. A thin section of tri-calcic di-aluminate ($3CaO, 2Al_2O_3$), magnified 50 diameters (Richardson).

tainebleau calcite envelops the sand with which it has crystallized.

In view of the slight solubility of hydrate of lime in water, the comparatively large size of these crystals makes it appear that their production is the result of a very slow reaction, differing from the simple hydration of quick-lime; and in watching their growth it is found that the process extends over a period of several months.

FIG. 16.

The amorphous mass which constitutes the principal portion of the hydrated cement, may be studied by following under the microscope the progress of the induration, as in the case of plaster of Paris. Some special precautions, however, are necesary to avoid the decomposition of the hydrated compounds of lime, both by an excess of water and by the carbonic acid of the atmosphere. A thin layer of cement fixed to a glass slide is covered with thin glass, and then immersed carefully in lime-water diluted by an equal volume of pure water. After two or three days, large crystals of hydrate of lime having strong double refraction will be found.

Furthermore, the cement will sometimes be entirely covered with extremely slender needles, scarcely more than 0.01 millimeter long, the ultimate interlacing of which will form the body of the cement. (See Fig. 4). More frequently, fibrous masses resulting from the aggregation of these minute crystals will be seen. Salts of ammonia quickly destroy them, leaving behind flakes of gelatinous silica, thus showing that they are composed of silicate of lime. Le Chatelier believes that they consist of hydrated mono-calcic silicate (SiO_2, CaO, 2.5 H_2O), such as he produced synthetically in his laboratory.

Lastly, at varying distances around the thin layer of cement, a number of small globules will be found which show a dark cross in parallel light. The distance between these globules is the index of a certain solubility which probably corresponds to that of an aluminate having the composition (Al_2O_3, 4CaO, $12H_2O$), which is the only aluminate that can exist in the presence of an excess of lime.

To exhibit the structure of some of the compounds of lime to which reference has been made in the foregoing, Le Chatelier gives a plate containing six figures engraved from photo-micrographs which is herewith reproduced, along with the explanations. (See Figs. 1-6.)

A special study of di-calcic silicate has recently been made by H. Passow and H. Kappen at the Chemico-Technological Experiment Station in Blankensee, Germany, and from the report thereof which was published in 1904, Figs. 7, 8 and 9, have been taken.

By courtesy of the publishers of *Cement,* several of the photo-micrographs which accompany Dr. Clifford Richardson's valuable paper entitled "The Constitution of Portland Cement," in that publication for July, 1904, are also reproduced here as Figs. 10-15.

To exhibit the microscopic appearance of the section of a briquette of English cement, composed of the particles which passed through a No. 76 sieve and were retained on a No. 100 sieve, Figs. 16 and 17 have been taken from Butler's work on Portland cement, London, 1899. The author states that in these two views the particles appear to be surrounded and cemented together by a white crystalline deposit, which was found on anlysis to consist largely of aluminate of lime; also that it can be inferred that the outer surface only of these relatively coarse particles was dissolved by the water and rendered an active binding material.

Fundamental Chemical Reactions

The formation of hydrated calcic aluminates during the hardening of cement is confirmed, at all events in the case of quick-setting cements, by the study of their progressive decomposition by water. If Vassy cement is agitated in water until completely hydrated, half the water being renewed every day, the liquid will contain in the outset about 1.20 grams of lime per litre, which proves the existence of free lime in hydrated cement. Subsequently, the quantity of lime dissolved in the water will diminish nearly in proportion to the quantity of fresh water added, and will eventually remain constant at 0.22 gram per litre, which agrees exactly with the rate of decomposition of the said aluminate. In one experiment, the observations were 0.28 gram of lime per litre on the third, 0.22 on the fourth and fifth, and 0.18 on the sixth day. It may therefore be concluded that the fundamental reaction attending the hardening of cement is the reduction of a basic silicate of lime into mono-calcic silicate and calcium hydrate, according to the formula (3CaO, SiO_2 + Water = CaO, SiO_2, 2.5H_2O + 2CaO, H_2O). As an accessory, a basic calcic aluminate will also be found, whose rapidity of hydration affects the more or less rapid setting of different cements, and whose probable reaction is indicated above. The ferrites of lime do not ordinarily play any part in the setting process, but when exposed to carbonic acid they de-

FIG. 17.

Fig. 16. Sectional appearance of a briquette made of coarse grains only of English cement, magnified 20 diameters (Butler).

Fig. 17. Sectional appearance of same briquette as Fig. 16, magnified 40 diameters (Butler).

compose and liberate hydrated ferric oxide, which affects quick-setting cements in noticeable degree.

The circumstances which cause cements to vary in rapidity of setting are very numerous. Besides differences in the chemical composition of the various ingredients, the fineness of the grinding, the porosity of the particles, the burning quickly or slowly at high or low temperatures, the proportion of aluminates and ferrites, the temperature of the air and water at the time of mixing, as well as the substances that may be dissolved in the water, all contribute to produce different results.

In general, the progress of the set can be observed with greater precision by means of a thermometer than by tests of the increasing hardness of the mass. It is often noticed that in the outset there is a period of inactivity during which the temperature does not rise, whence it appears that the chemical reactions of hydration do not begin immediately. Soon afterwards, however, the temperature rises suddenly and the setting proceeds rapidly. This peculiarity is associated closely with the phenomena of solution and supersaturation. As long as the process of solution alone goes on, there is little or no development of heat, and setting does not occur; but as soon as the degree of saturation is reduced by the crystallization of the substance in solution, the setting begins and manifests itself by a rapid evolution of heat.

The subsequent hardening of the mass is due exclusively to the slow and progressive hydration of the silicate of lime, which began during the set and continues thereafter almost unattended. Its rapidity is of little interest, as the ultimate hardness attained by the material is the important feature. Some consider that cements will attain a certain degree of hardness which will continue indefinitely; but this is often not the case, as experience has taught that after having reached a maximum the strength of the mass will begin to diminish, thus forming a third phase of the process of induration.

Elements Governing Hardness

The hardness of a hydraulic mortar depends on two factors, viz: the cohesion of the crystallized compounds produced, and their adhesion to each other and to the sand with which the cement is mixed. The adhesion depends principally on the nature of the substances in contact, and the relative position or location and extent of the abutting faces of the crystallized substances.

Crystals of identical nature, meeting in the course of their development, unite more or less completely. If their relative position is such that the surface of contact defines two reticulated planes which can be super-imposed, the crystals may unite so as to form only a single individual, and in this case their adhesion will be equal to their molecular cohesion; but in general this does not happen, and it is found that the adhesion of two crystals located otherwise is much less than their cohesion. This may easily be demonstrated by allowing a dissolved salt to crystallize by cooling, and then breaking with the fingers the groups of crystals so formed. The force required is less than that for breaking an isolated crystal, and the surface of rupture exhibits numerous plane facets, thus indicating that the separation took place along the sides of the contiguous crystals instead of transversely thereto, which would have produced an irregular surface.

Furthermore, if an inert foreign body, such as sand, is added to cement in order to increase the resulting volume of mortar, the adhesion of the hydrated cement crystals to this body must also be taken into account. This adhesion depends on the chemical nature of the body and the condition of its surface. It is a common experience in laboratories to find that salts which crystallize on the sides of a glass vessel adhere more or less tightly. Some of these crystals, like those of barium silicate, are more readily broken than detached, while others, like those of calcium sulphate, drop off by their own weight. The condition of the surface of the foreign body, whether rough or smooth, is likewise a matter of great importance with the adhesion, as it is well known that in calcareous mortars the roughest or sharpest sand gives the best results. The roughness not only increases the surface of contact, but also prevents the propagation of fissures or cracks in the homogeneous crystalline binding material.

The strength of a mortar thus depends on the extent of the surfaces of contact between the several constituents, and this in turn varies with the form of the crystals, the volume of voids or interstices left after setting, and the manner in which these voids are distributed throughout the mass. A very slight adhesion per unit of area may, if the surface is large enough, give a resultant strength equal to that of the molecular cohesion of the crystals; and the surface of the latter increases in proportion as their shape becomes elongated, or varies from a spherical form in which the surface is a minimum for a definite volume. The form of elongated prisms, as found in the crystallization of plaster of Paris and all similar products, is therefore highly favorable for the development of adhesion.

The quantity of water necessary for making mortar of the usual consistence is generally much greater than that which can be solidified or combined in setting. This excess of water remains imprisoned in the mass and forms interruptions of continuity which diminish the surfaces of contact between the solids. If these spaces containing water or air did not exist, the crystals might be in contact on all sides, whereby the adhesion would become a maximum. In proportion as the volume of voids increases, the extent of the surfaces of contact reduces until finally there will be no setting and the mass becomes semi-liquid with the solids carried in suspension.

It is therefore evident that the volume of water which the mortar can bear without stopping the set depends essentially on the form of the crystals. Le Chatelier states that elongated prisms will carry much more water without ceasing to come into contact than cubes, and computes that such crystals which are ten times longer than their width and thickness will carry, without completely stopping the set, an excess of water fifty times greater than in the case of cubical crystals. Hence it follows that when mortar which contains an excess of water sets, very elongated crystals must be formed, and this conclusion is also established by direct observation, independently of any theoretical considerations.

The crystals and voids, however, are by no means distributed uniformly throughout the mass of mortar, and consequently the strength of the latter is greatly affected thereby. The more or less rounded grains of sand touch each other at

certain points, around which the distance between the grains increases progressively. If all the cement could be concentrated in these interstices, its useful effect would become a maximum. Now if the cement is uniformly distributed in them along with a large excess of water, it is very evident that most of the crystals formed by hydration will not be in contact with the sand, but in a much less favorable condition of efficiency. The concentration of the cement at the desired points, however, is accomplished simply by the capillarity of the water, if the mortar is allowed to drain, as the water will then recede into the smallest interstices and carry with it the finely powdered cement. Thus the strength of a briquette may be doubled by merely placing it immediately after molding upon the porous surface of a slab of dry plaster.

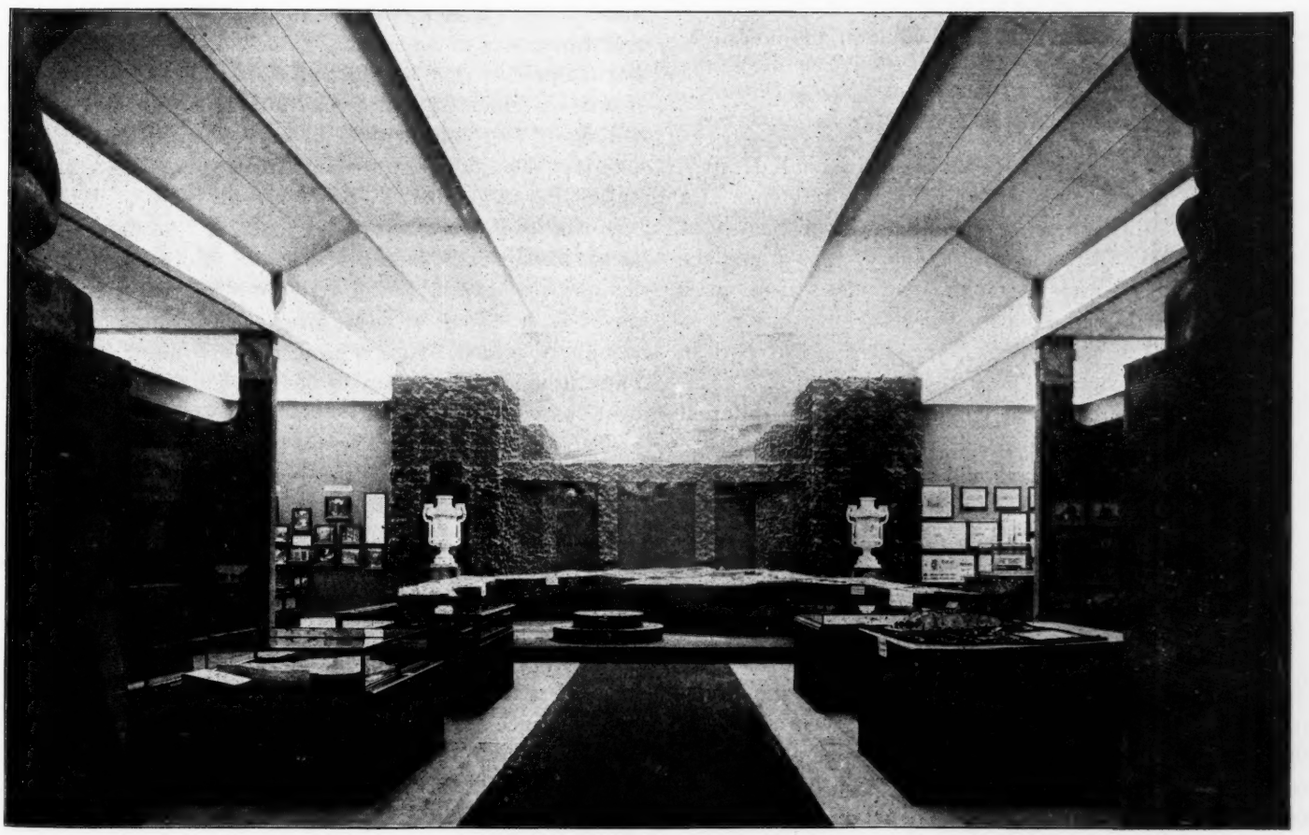
The crystals become longer in proportion as they are precipitated from a more highly saturated solution, and fineness of grinding facilitates the hardening process as it increases the extent of surface exposed to the solvent action of the water. Quick-setting cements burnt at very low temperatures doubtless owe the rapidity of their hydration to their porosity, which enables the water to find its way soon into the interior of the particles.

An increase of temperature to accelerate the chemical reactions of hydration has also been considered advantageous to the hardening of cements; but experience has shown that between 0° and 100° C. the ultimate hardness of good cements is not appreciably affected, and that the only effect of raising the temperature is to obtain this hardness more quickly. It is also possible that the temperature affects the length of the resulting crystals in a sense opposed to the influence which augments the supersaturation.

The development of the crystals is furthermore affected considerably by the presence of small quantities of foreign matter in the water used in mixing, but our knowledge in this respect is still too incomplete to admit of more than general statements. It may therefore suffice to mention that this element seems to account for the different results obtained by mixing the same cement with rain-water, river water, and water containing sulphate of lime.

In conclusion, it may also be mentioned that the development of the crystals is affected by the number of centers of crystallization which are formed in the supersaturated liquid. The fewer these centers, the longer will the crystals become and the more favorable will be the conditions for hardening. It is, however, very difficult to foresee the circumstances that determine the development of the primary crystals, and it is doubtless in this direction that the cause of the bad results obtained with cements that have been long exposed to the air must be sought. The air-slaking of only a small percentage of the active elements of a cement affects its qualities greatly, and its ultimate strength is reduced in much higher degree than is accounted for by regarding the air-slaked grains as inert matter, since by creating a multitude of centers of crystallization on the surfaces of these slaked particles, the requisite supersaturation of the solution is opposed.

(To be continued.)



PART OF THE EXHIBIT AT DRESDEN IN CONNECTION WITH THE EXPOSITION OF GERMAN MUNICIPALITIES

GARBAGE DISPOSAL WORK IN AMERICA

A Summary of Conclusions Reached—Disposal of Institutional Waste by Cremation—Statistics of American Cities

By Col. W. F. Morse, Sanitary Engineer

THE American Public Health Association for all the term of its existence, now thirty-two years, has been recognized as the leading authority on questions of sanitary science and practical hygiene. For upwards of fourteen years this association has continued a "committee on garbage disposal," whose yearly reports include the description of the various methods and processes employed in this country.

In October last, at the annual meeting in Washington, D. C., a report was made by the chairman in the nature of a summary of the work of the committee to date, and there were read two papers dealing with the subject. As the committee is no longer continued, this final series of papers may be taken as the last official report of the association on the subject, and as fairly representing the present situation in waste disposal in this country.

In the September issue of the MUNICIPAL JOURNAL, in reviewing the work on "Refuse Disposal and Power Production," by W. F. Goodrich, M. I. C. E., I dwelt on the subject of the advance in the system of garbage disposal in England. In the present article I shall deal with the same subject as it relates to America by submitting the two papers referred to above, together with my own researches in regard to the disposal of waste by cremation. A summary of the conclusions reached should be of value in any investigation of the subject.

SUMMARY OF MR. HERING'S REPORT

The earlier portions of the paper by Mr. Rudolf Hering, C. E., chairman of the committee, contain a reference to a discussion upon this subject before the American Society of Civil Engineers in December and January, 1902-3, and the conclusions reached after a statement of views from some fourteen gentlemen whose papers and discussions covered in four meetings of the associations every phase of this work in a pamphlet of 154 pages. These were:

1. That the different local conditions demand different methods of collection and disposal.

2. That each municipality should select the method which after a careful study of the specific local conditions and a further careful investigation of the cost of securing satisfactory results, proves to be the most economical in construction and maintenance.

3. That the problem must include a consideration of the methods and costs of handling all of the several kinds of refuse, between the origin in the houses and on the streets and the points of final disposal; the four several kinds of refuse being (1) ashes, (2) street sweepings, including manure, (3) dry rubbish, and (4) kitchen garbage, swill or slop.

4. That the garbage question has now reached a point where the proper solution of each case requires the aid of the engineering profession, just as the construction of sewerage and other sanitary works.

Mr. Hering very briefly describes the various methods of disposal: feeding to swine, dumping on land and in water, plowing under the soil, reduction or extraction of grease, and finally cremating organic matter. He says in conclusion, "Each city should therefore study the question as related to its own special conditions, and from the large experience both in Europe and at home, select what is found best for itself."

SANITARY DISPOSAL OF WASTE BY CREMATION

In this paper, which was presented by myself, the writer claims that waste disposal by cremation has not made progress, is rather receding than increasing in numbers of furnaces built for city work, and instances one example of the largest city of this country compelled to terminate a contract, for sanitary and business reasons beyond the power of the crematory company to fulfil.

The failures of the past year promise no relief unless there be a radical change in methods of business, and in design, material, construction and operation of crematory furnaces.

In dealing with the waste disposal of *business establishments* he cites examples where the heat is applied for many useful purposes in connection with steam power, and shows that the process may be brought into use where the amount of waste is sufficient to afford a continuous daily supply, and will save a very considerable quantity of coal. These plants for great department stores and large factories are rapidly multiplying in number.

Institutional waste from hospitals and sanitariums demands instant and efficient destruction, and the furnaces for this purpose have increased far beyond any other particular line of work. Some of these, for great institutions, are large enough for a town of 5,000 people. The United States government has installed many of one particular type at government posts and navy yards.

The reclamation of city refuse by sorting out the marketable parts and destroying the residuum as at Boston and Buffalo, in specially constructed refuse utilization stations, is briefly referred to as a coming possibility in the larger cities.

The final paragraphs of this paper state concisely the results of the work done by destruction in Great Britain in the past twenty-five years, cites statistics of rapid development of this work consequent upon the use of forced draft, the increase in steam power developed, and the complete immunity from nuisance because of the high temperature obtained.

In concluding, the writer urges that this is the successful result we should seek to obtain for this country. He says:

"There is no radical difference in the character of the people, the manner of living, or the waste elements discharged from the life of the public.

"With the same agencies acting under similar conditions, employed upon the same work, it is as certain as daylight that equally profitable results are to be obtained." It is a question "of the clear understanding of the results already achieved abroad, and of opportunity for the successful application of the same methods in this country."

Disposal Statistics of American Cities

This paper is a contribution to the present history and conditions of the work of American garbage disposal such as has never before been printed. The work of two young students, C. A. E. Winslow and P. Hansen, from the biological laboratories of the Massachusetts Institute of Technology, it purports to be only "a certain amount of first-hand information as to the condition of garbage disposal practice in the year 1902," as it was compiled as a study in the course of municipal sanitation at the Massachusetts institute.

The information in the first table—a list of 161 cities, ranging in population from 25,000 upward—is tabulated under these several heads: City, Population, Regular Collection, By Whom Collected, Separation of Material, Disposal of Ashes, Disposal of Combustible Wastes, Disposal of Garbage.

It will be seen that these headings contain about all information upon this subject that can be had. The returns are very full and complete, a few blank spaces appearing. This table is the basis of a series of analyses that are very instructive. Of 146 cities reporting on collection, 61 have it done by municipal control, while in 85 cases contractors or private parties do the work. Only 40 per cent. of the towns had inauguraed a system of municipal removal. Out of 146 cities 111 report a more or less complete separation of waste materials.

The types of crematories in use are thus tabulated:

"Dixon, 9; Engle, 6; Smith, 3; Davis, 2; Brownlee, Decarie, Lister, McKay, Thackeray, and Vivarttas, one each. In three places, Atlanta, San Francisco and Waterbury, the furnace was operated by contractors; in all others by the municipality."

The mortality in this list of furnaces, which were reported only a year ago, indicates the rapidity with which they pass out of use. At least two of the Dixon, one of the Engle, three of the Smith, the Lister and the Vivarttas, are all now either abandoned and out of use, or about to be replaced by others. At Atlanta the disposal will be hereafter by the use of municipal work.

The figures for cost of fuel and labor, as compared with quantities destroyed, are most confusing and difficult to tabulate. So much depends upon local conditions and cost of fuel that figures not accompanied with explanations do not give a clear idea of cost. For instance, it cost at Fort Wayne, $3,431 to burn 7,000 tons, or about 49 cents per ton, while at York, Pa., it cost 90 cents, and at Jacksonville, $1.08, the work being done by the same cremator.

The table following, compiled by the writers, partly from other sources than the reports received from the cities, is given as an attempt to convey some idea of what has been the cost at the various places. It would be hardly fair to take an average of this, as was done with the 144 English cities, as the result, 90 cents per ton, would not fairly represent the cost. These writers say:

COST OF DISPOSAL OF GARBAGE BY CREMATION IN AMERICAN CITIES.

City.	Type of furnace.	Cost per Ton.
Lowell	Engle	$1.05-2.19
Lancaster	Davis	2.10
Trenton	Davis	1.71
Milwaukee	Engle	1.12
Jacksonville	Dixon	1.08
Camden	Dixon	.73-1.00
Atlantic City	Smith	.99
Muncie	Smith	.90
York	Dixon	.80-.90
Dayton	Dixon	.80
Bridgeport	Dixon	.35-80
Yonkers	McKay	.75
Joliet	Dixon	.67
Portland	Engle	.60
Richmond	Engle	.60
Wilmington	Dixon	.60
Minneapolis	Decarie	.55
Terre Haute	Brownlee	.50
Fort Wayne	Dixon	.49
Atlanta	Dixon	.34
Alleghany	Rider	.25

"Ordinarily, then, we may say that the cost of cremating raw garbage by the American method ranges from $0.50 to $1.00 per ton, these figures probably in no case including any allowance for interest or sinking fund."

Here these gentlemen have failed to get the best and most reliable reports, as one city, Norfolk, Va., after using an Engle Cremator for ten years, reports officially the disposal of 60,000 tons of garbage at a cost of 50 cents per ton, *including all repairs for the same time.*

Upon methods of disposal by reduction, the information submitted contains an array of figures of quantities and maximum cost for treatment, but few reliable details. Taking New York for an example. "It would be safe to say that the cost of the whole city is over $1.50 per ton." The figures are not very conclusive, since it has always been the policy of reduction companies to give out as little information as possible in regard to their work. On the score of nuisance they say "Complaints of nuisance from reduction works of this type have been numerous, particularly in New York, Philadelphia and Boston."

The Chamberlain process in operation in Cincinnati, Cleveland, Columbus, Detroit and Indianapolis does not differ widely from the Arnold process.

The Holthaus process at Syracuse is the most expensive and least offensive in operation of reduction works. A summary of the cost by reduction is as follows:

City.	Type of furnace.	Cost per Ton.
Syracuse	Holthaus	$2.16
St. Louis	Merz	.93-1.86
New York	Arnold	.62-1.50
York		.80
Indianapolis	Chamberlain	.69
Boston	Arnold	.60

SEPARATION OF WASTE NOT DESIRABLE

The final conclusion of the paper, after briefly alluding to the relative cost of disposal in America as compared to the English destructor system, is as follows:

"The experience of the last few years has, in our judgment, only confirmed the conclusions of the committee on the 'Disposal of Garbage and Refuse,' that separation of waste materials is neither economical nor desirable, that the cremation of mixed refuse appears to be the most generally satisfactory process, and that this cremation may be best accomplished in furnaces of the English type."

These three papers from three sources entirely distinct and unlike each other, may be taken as representing the views of persons who are competent to judge from an engineering standpoint, of those directly interested in the construction and sale of apparatus for disposal work, and the unbiased reports of men who are endeavoring to collate for future use information as to methods. The conclusions arrived at in each case are practically identical, and may be thus stated:

1. That the methods employed, both in reduction and cremation, are at the present time very expensive and unsatisfactory in results.

2. As compared with the work reported from the English methods of waste disposal, it is far below their standard, both in immunity from nuisance and cost and efficiency of operation, represents hardly anything in the way of utilization of heat or power.

3. That only by bringing into the question the best engineering skill in the country can any progress be made and secured.

In a future article the writer will endeavor to account for some of the causes which have brought about the present situation in waste and garbage disposal in this country.

MUNICIPAL PURITY IN ENGLAND

Corruption UnKnown in English Municipalities—Public Ownership an Important Factor in Civic Advancement—Comparison of Civic Methods

*By Robert Donald**

It is necessary, in any consideration of the advances made in England toward the betterment of municipal administration, to consider London apart, for the greatest advances have been made in other municipalities of the kingdom. The reform movement in London dates only from fifteen years ago, when the London County Council was organized, so that the best results in improved municipal administration are to be found outside of the metropolis.

I do not mean to infer by this that great strides forward have not been made in London. They have. In many particulars which are now recognized as essential to adequate and intelligent administration the London County Council has been a pioneer. This is especially true of its recognition of the social obligations the municipality owes to the people.

Thus it has established recognition of the minimum wage for laborers; made secure the eight-hour day; extended the policy of obliterating old, dilapidated and unhealthy workingmen's residences, erecting in their stead modern tenements, and of abolishing the one-room home for the families of working people.

CODE OF MUNICIPAL HONOR HIGH

As a general proposition, it may be said that there is no corruption in our municipal administration. The abolition of corruption dates from the abolition of the great contracting corporations in the municipalities, the three elements which now make for purity in the government of our cities being:

Unselfish public servants—that is, men who are willing to serve the people for the glory that attaches to office, and without thought of pecuniary reward.

An adequate civil service, by which the subordinate officeholders are assured of life tenures of their positions.

The elimination of the great corporations in the construction of public works and the management of the public services.

These three elements represent a gradual growth, and it would be unfair to contrast American municipalities with those of England that enjoy these advantages. You are too young on this side of the Atlantic to be expected to have advantages that come only with settled communal life. But the effects of these advantages are very positive.

Taking up the details of municipal administration under these three factors, street improvement in London may be accepted as entirely representative. The London County Council is now working out a great problem, north of the Thames, in a thoroughfare which is to run north and south, and to be known as the King's way.

In undertaking such a project the municipality proceeds to acquire the whole area to be bettered. Instead of taking only sufficient land for street purposes, it takes all the land on either side of the proposed thoroughfare which will be bettered. The most serious difficulty is encountered, of course, in acquiring this land.

ACQUIREMENT OF PROPERTY

This work falls within the province of the public valuer, who proceeds to buy as much as possible at private sale, operating always through independent brokers, and never directly with the owner. Should it become necessary to condemn property, the actual market value of the land is ascer-

* Mr. Donald is editor of the London Daily, Chronicle, the London Municipal Journal and the Municipal Year Book. He is the recognized English authority on municipal administration.

tained by reference to the record of recent sales in the neighborhood, and the city tenders the owner this value, plus 10 per cent.

After the land in the area of betterment has been acquired, by private purchase or by condemnation at the market value, plus 10 per cent., the whole area is municipalized. In other words, it becomes the unalienable property of the municipality, which, instead of selling parcels to people who desire to erect buildings, creates leaseholds running for a period of eighty-four years. For these privileges the leaseholders pay an annual ground rent, and at the termination of the leasehold, the land, with its improvements, reverts to the municipality, and may then be resold to another leaseholder for a like term.

In the matter of improving the streets in such an area of betterment, the municipality does all of the work by direct employment of labor. No contractors are engaged except in the case of specialized pavements, like wood or asphalt, and in these instances the contracts are awarded only after public competitive bidding. In building the street, the municipality builds at the same time a subway of sufficient size to accommodate two lines of cars. This is building for the future, and while it increases the first cost, it makes for economy in the long run.

In the public services, such as the collection of garbage, electric and gas lighting the water service, and even the street railways, the private corporations have been almost entirely eliminated. English municipalities, without exception, now do on their own account all the scavenger work necessary within their limits.

Revenue Obtained from Waste

Garbage incineration plants are erected, usually convenient to the electric-lighting stations or the free baths, and the combustion of the garbage is utilized to supply heat for the boilers of the electric-lighting stations or for heating the waters of the public baths. A direct revenue is also derived from this process, for the clinkers remaining after the garbage has been incinerated are sold to contractors in the provinces for road-building, while the fine dust is utilized by the municipalities in the making of paving blocks.

As for electric lighting, the municipality has always the first right to this privilege. If it refuses to avail itself of that right, private corporations may obtain franchises; but these franchises are limited to forty-two years. At the end of that period they become the property of the municipality upon the payment of their value at that time, depreciation being deducted.

The experience with municipal ownership of electric-lighting plants has been to immensely popularize the use of electricity, the municipalities following a policy of bold development never attempted by the private companies. Under the present system the municipality will furnish you a motor to run your machines, charging you a small annual rental, and making its real return from the sale of the current, the price of which has been greatly reduced under a municipal ownership. It will, too, furnish you with electric lamps and fans, or wire your house, assuming all responsibility of depreciation, and renewing the appliances as often as may be required. This same policy obtains with reference to the gas plants, municipalities now furnishing upon request gas ranges, slot meters and other gas appliances.

The administration of the water service is almost truly socialistic. The meter system is unknown except for trade purposes, the rates for household consumption being fixed at a given figure per pound of rental assessment, with no limitations as to use. Thus the poor man in Whitechapel, who may only be assessed on £5, may use water from the municipal mains as freely as the rich man in Park Lane, who is assessed on £5,000, the principle being that water should be furnished to all the citizens according to their needs, and not according to their ability to pay for it.

Railway Franchises Limited

The ownership and operation of street railways by English municipalities has proved the simplest and easiest thing they have ever undertaken, because it is almost automatic. Franchises are granted to private corporations for street railway service for a period of only 21 years, at the end of which time they become the property of the municipalities at an actual valuation. The revenues are constant, little difficulty is experienced with power, for it is generally taken directly from the municipal electric-lighting station, and the whole policy of the management is to reduce the rates of fare and improve the service.

In the first particular, a sliding scale is now firmly established, with the rate for short rides reduced to 1 penny in American currency, and increasing according to the distance traveled. As the great majority of passengers travel for short distances only, the effect of this reduction has been to make the average fare paid on English street railroads considerably less than 1 cent in American money. And this is accomplished with a service vastly better and more popular than was ever rendered by private corporations, together with ample workingmen's cars in the early morning and late evening, with still lower fares for the workingmen.

In many of the municipalities, public telephone systems are now being operated in competition with the private corporations. In London this is done by the post-office instead of by the municipality; but in Glasgow the municipal system has quite as many subscribers as have the private companies, give an improved service, and make a charge for an unlimited number of calls of only $25 a year.

In all of these public service and utility the aim is to so manage them that the branches of the municipal government revenues will balance with the cost of operation, and whenever they show a profit at the end of the year the charges are reduced.

Taking in the whole field, it may be said that in English municipalities the great source of danger is not in public corruption, which is unknown, but in the drinking saloons. These institutions wield a pernicious influence always, and are ceaselessly active in politics, always laboring for the election of those who promise reduction in the assessments.

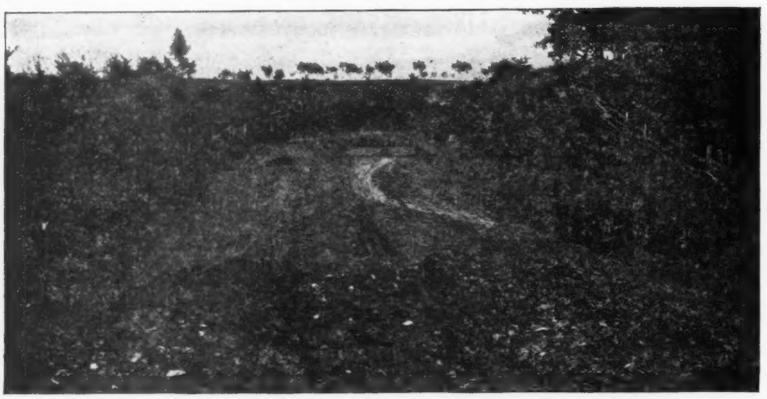
Latterly the London County Council, in all of its public improvements, has been buying in the licenses held by saloonkeepers within the areas of betterment, and absolutely extinguishing them; but the number of these public houses is still large, and they present the greatest danger that confronts the integrity and purity of our city governments.

MAINTENANCE OF HIGHWAYS

Improvement and Repair of Public Roadways—Guidance of Highway Commissioners Where the Money System Obtains

*By Henry A. Van Alstyne**

THE matter herein contained is embodied in the conclusions of the Department of the State Engineer and Surveyer of the State of New York in a bulletin on the question of the improvement, repair and maintenance of public highways, containing directions for the guidance of highway commissioners in towns that have adopted the "money" system of working highways. The roads of each town should be divided into as many districts as may be necessary in order to have every mile of road placed in the best possible condition on or before June 1 of each year.



BEGINNING WORK JULY 28, 1903—COMPLETED WORK BELOW

Each district should be placed in charge of a competent foreman who should be provided with suitable tools, machinery and men to properly care for the roads under his charge. As early in the spring as possible all waterways, ditches and culverts should be opened, and the work of perfecting the drainage and improving the surface of the road should be commenced.

MAINTENANCE AND REPAIR OF EARTH ROADS

The best grade and form and most perfect system of drainage for an earth road constitute the best preparation for a gravel or macadam road, should either of these surfaces be added at a later date. The steepest grades on a road limit the size of loads which can be drawn over the road. Effort should be made to reduce the steep grades by cutting the top of each hill and filling in at the foot. The gain thus made is best shown by the following results of tests by which it has been demonstrated that a pair of horses drawing a load of 4000 pounds on a level road can only draw with the same effort:

3600 pounds on a 1% grade or 1 foot rise in 100 feet.
3200 ponds on a 2% grade or 1 foot rise in 50 feet.
2880 pounds on a 2½% grade or 1 foot rise in 40 feet.
2100 pounds on a 4% grade or 1 foot rise in 25 feet.
1600 pounds on a 5% grade or 1 foot rise in 20 feet.

In towns where the Highway Commissioners have been the most successful the following plan has been adopted:

Three teams are required to properly operate a road machine and progress the work fast enough so that those engaged in working the highways can occupy their time to the best possible advantage. In addition to this, one team and wagon with dump-box and field-drag or harrow should be provided and also four or five laborers. With this force the road should be brought to a proper crown, and loose stones, sod and organic matter should be immediately removed. On a basis of cost of $4 per day for one team and driver, and $1.50 a day for labor, the total cost per day would be as follows:

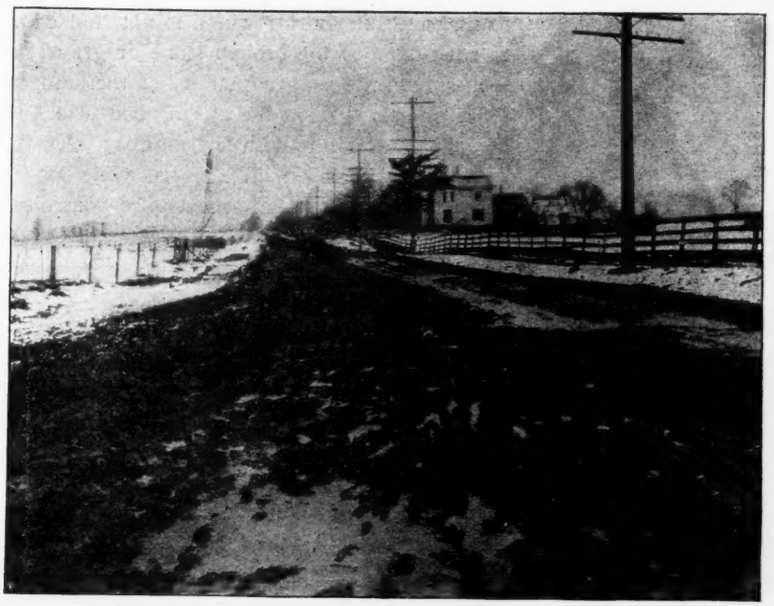
4 teams, at $4 per day	$16 00
2 laborers on machines, at $1.50 per day	3 00
4 laborers following machine, at $1.50 per day	6 00
Total	$25 00

A foreman thus equipped should be able to clean up and crown from two or three miles of highway on an average each day, and at a cost of from $8.50 to $12.50 per mile. The balance of the funds in the hands of the Supervisor subject to the order of the Highway Commissioner can then be used in the removal of stones every thirty days as provided by law, the cleaning of culverts and ditches, perfecting the drainage and improving the road surface; and for such other repairs and permanent improvements as the Commissioner of Highways and the Town Board may determine and direct.

COMPLETED, OCTOBER 29, 1903. MONROE COUNTY, N. Y.: SCOTTSVILLE ROAD, NOS. 63 AND 79, SOUTHWEST FROM ROCHESTER, N. Y.—SHOWING IMPROVEMENT BY STATE ENGINEER DURING 1903. BASE AND TOP OF CRUSHED LIMESTONE, BOUND WITH SCREENINGS OF THE SAME. WIDTH OF MACADAM, 16 FEET.

* State Engineer and Surveyor of the State of New York. Mr. Van Alstyne has been renominated for the office on the Republican ticket.

It has been suggested by some Highway Commissioners that late in the fall it is desirable to plow the sides of the earth road between the wheel tracks and the ditch. If this is done, the sod will decompose during the winter months so that when the Highway Commissioner begins to work the road in the spring, the vegetable matter is readily separated from the earth, and the amount of work that can be performed with a road machine is greatly increased, so that it would seem desirable to recommend such course.



CONDITION OF ROAD MARCH 15, 1900, BEFORE IMPROVEMENT OF ROAD NEAR ROCHESTER, N. Y.

Drainage of Earth Roads

One of the most important matters involved in the maintenance of any highway, whether earth, gravel, or macadam, is that of drainage. Water is the natural enemy of an earth road. Three systems are used in the proper drainage of a road: Surface drainage, side-ditches and under-drains.

In forming the surface of the traveled way, care should be taken to keep it well crowned so that the water will quickly run off into the side-ditches. Under-drains are usually of no use in draining the surface of the road, for, in order to reach them, the water must first soften and then soak through the surface. The crown should not be so great that vehicles are compelled to keep in the center, as in that case the road will be worn hollow and surface water will be retained. In the cases of too much crowning it is sometimes difficult for vehicles to turn out in passing. Provided the road is properly maintained and the surface kept smooth, a crown of one inch to one foot is ample. More crown is required, however, on very steep grades, as the water in flowing from the center of the road to the sides travels diagonally and not at right angles to the center-line, as is the case on a level road. If the surface is too flat the water will follow down the center, the wheel tracks will become deepened, stones become loosened and the road surface made rough and dangerous. It should be remembered that surface drainage depends largely on maintenance, and that in order to get the best results the surface should be kept smooth and free from ruts and holes or depressions.

Side-Ditches to Roadways

One of the principal causes of the poor condition of the ordinary dirt road is the lack of proper side-ditches. These ditches serve to carry off the surface water from the road and also to intercept the water from the adjacent side hills. In places where no tile drains are laid, the ditches also serve to drain the subgrade to a certain extent, although a tile drain is much more effective for this purpose. If the road has been properly under-drained, there is no necessity for very deep side-ditches. The ditches should be so formed that nearly all the rough work can be done by the road machine or scraper, care being taken to make the slope on the road-side flat enough to avoid accident to a vehicle should it be crowded off the traveled way. To be most effective, the side-ditches should be dug to a uniform grade and should have an unobstructed outlet into some stream if possible.

Water should never be allowed to stand in the ditches to evaporate, but should be led away from the road as quickly as possible. It is also inadvisable to carry water for long distances, as damage from washing and scouring is sure to occur after a thaw or heavy shower. The ditches should discharge as soon as possible into the natural watercourses. It is often necessary to lead the water from the high to the low side of the road, and in doing so it is a common practice, especially on steep grades, to dig a gutter or build diagonally across the road a small dam commonly called a "Thank you ma'am." These are both objectionable methods and should never be used. The water should always be carried under the roadbed by means of culverts, the size being determined

SAME ROAD AS ABOVE AFTER IMPROVEMENT

by the volume of water to be carried and by the fall in the culvert. Stone or concrete box-culverts are superior to pipe

AN ONTARIO COUNTY ROAD, N. Y., BEFORE IMPROVEMENT

for this purpose as they are less liable to freeze or to become clogged and damaged, and are more easily cleaned. Stone flagging or concrete slabs supported by steel I beams or rails should be used in preference to plank for covering culverts having less than eight or ten feet span.

How to Make Concrete Slabs

Provide a mixing-bed eight feet wide and ten feet long formed of smooth boards laid close, or of sheet iron. Never mix mortar or concrete on the ground. Make an open box six inches deep, two to three feet wide and from three and one-half feet to four and one-half feet in length, as the span may require. Whenever the necessary width of opening exceeds three feet, I beams of steel must be used to span it, and these must be placed two or three feet between centers, this distance varying inversely with the width, and the slabs made to span this distance between the centers of the beams. Provide expanded metal of Guage No. 4, formed of steel 3-16 inch thick, 5-16 inch wide, in meshes 6 inches wide and 12 inches long and weighing 1 1-10 pounds per square foot, and costing 5 cents per pound, and cut into sheets of sufficient size to nearly cover the proposed slabs, being careful that the 12-inch mesh crosses the span.

To make the concrete, use one part loose Portland cement, two and one-half parts sand and five parts broken stone or gravel not exceeding one inch in size, all being measured in loose bulk. If stone from a crusher is used, screen out the fragments larger than one inch, and use for the concrete all the product less than one inch, allowing the dust to act instead of one part of sand. If gravel is to be used and is not clean, it should be washed in running water until the water runs away clear. Before using any cement, blend the contents of several bags or barrels—about five—so that if one bag or barrel is poor it will be mixed with four good ones. Thoroughly mix the blended cement and the proper amount of sand before wetting; then add enough water to make a thin mortar which is not thin enough to run; dampen the broken stone or gravel; and then spread the proper quantity of the dampened stone or gravel upon the mixing bed in a 4-inch layer, and cover it with the mortar; mix thoroughly by turning with shovels while working with hoes until all fragments are coated with mortar. The mass thus formed should flatten and quake when put in a wheelbarrow or pail, but should not be fluid. Spread over the bottom of the box a coat of mortar followed by a coat of fine concrete making a layer of 1¼ inches thick after ramming, and upon this lay the sheet of expanded metal and embed it in the soft concrete by ramming, using care that the 12-inch length of the mesh lies with the lengh of the span of the slab when it shall be put on the culvert. Fill the box, working the stone from the sides with a trowel so that the edges will have a smooth surface; ram thoroughly until no stones or gravel can be seen and until the wet mortar comes to the top, and also smooth the top with the trowel. Keep this covered from the sun and wet it night and morning for a week until hardened, when it can be easily taken from the box. After it has set for an hour, scratch the word "TOP" in large letters in the soft mortar, so that it may surely be thus laid in the work, as the slab will have little strength if laid with the embedded metal up. Do not make concrete in freezing weather, or else make it where it can be protected from frost. Such slabs can be made in winter by making them in a warm place free from frost and storing them for use until they are set and hard.

The flag-stone or concrete-slab cover can be covered by the road material, and if the culvert is properly built there will be no expense for maintenance, as in the case with a plank top. No culvert should be built less than two feet in

THE SAME ROAD AFTER IMPROVEMENT

width so that it may easily be kept free from obstructions at all times. The bottoms of all culverts should be given sufficient fall to send the water out of them quickly. The bottoms, and spaces three or more feet wide at the inlets and the outlets, should be paved to prevent undermining, using flat stones set on edge and close together with the joints filled with coarse sand or fine gravel, or using cobbles properly embedded. The side ditches should also be similarly paved where long grades of five per cent. or over occur.

Gravel for Surfacing Earth Roads

Any road-surfacing material should be of the same quality and degree of hardness and durability throughout, so that the surface may wear evenly and remain smooth and free from hollows or depressions caused by traffic. *Never under any circumstances, place on the surface of the road, sod, roots, any organic material, or any worn out dust or mud scraped from the ditches or sides of the road.*

Gravel should be the best which can be obtained in the vicinity of the road. The fragments of stone should be hard, tough and durable. Their size should not exceed one inch in greatest dimension, the larger stone should be screened out or raked off after placing on road and used in the foundation. Several sizes should be so proportioned that the smaller ones are just sufficient to fill the interstices between the larger ones, and the gravel should contain a sufficient amount of binding material to fill the remaining smaller interstices so as to form one solid impervious mass. The binding material may consist of clay, or loam which is clay mixed with sand and vegetable matter and has many of the characteristics of clay, sand, stone, dust, or some material that is fine enough to fill all the voids and make the finished gravel surface impervious to water when properly drained, crowned and shaped.

Maintenance of Gravel Roads

After a newly constructed gravel road has been thrown open to traffic it should be carefully watched in order that any defects may be remedied at once. Shallow ruts and depressions should be repaired without delay or serious damage will be the result. In repairing a new road the gravel on the sides of the depression can be raked off in place; but after a time it will become necessary to fill the depressions with new material. In the latter case the old hardened surface should be slightly loosened with rakes in order to get a bond between the old and the new material. The gravel used should be smaller in size and should also contain more binding material than that used in the construction. This material should be stored in piles along the road side, containing fifteen or twenty cubic yards each. Smaller piles are soon scattered and wasted.

Loose stones should be raked off the road surface as soon as they appear. They are uncomfortable for the traveling public, spoil the beauty of the road, and help to destroy it.

Maintenance of Macadam Roads

After a macadam road has been completed and opened to traffic, it is very important that the surface be kept smooth and free from depressions. It is a mistaken idea that when a stone road has once been properly constructed no further work is necessary. It is of the greatest importance that the completed road should receive constant care and attention in order that any defect which may appear, may be immediately repaired before serious damage is done.

There are several causes for the various defects appearing from time to time, one of the most serious of which is the picking by the calks of the horses' shoes. The constant pounding of the shoes tends to loosen the binding material and the exposed stone in the top course. A few stones loosened in this manner and pounded around by the impact of the wheels have a tendency to loosen others and at the same time to loosen the binding material which is the more quickly blown and washed off by the rain. The effect of the horses' feet will be especially noticed on steep grades, and in the spring of the year when the horses are "sharp shod."

BITULITHIC PAVEMENT IN ST. LOUIS

The Bitulithic pavement has been put down in Lindell, Delmar and West Pine boulevards and is now being laid in other streets in St. Louis. The St. Louis *Republic* in discussing the merits of pavements, says that there is no city in the Union where a more exacting test of the Bitulithic paving has been made than in St. Louis. This pavement has been laid on Lindell boulevard, from Grand avenue to King's highway; Delmar, from Grand to Taylor avenue, and from King's highway to Union avenue; West Pine, from Grand avenue to King's highway; Maple, from Hamilton to Hodiamont; Chestnut, from Broadway to Twentieth; Hickory street, from Broadway to Eighteenth; Fair, from Algernon to Florissant; Theodosia, from Hamilton to Hodiamont; Marcus, from Page to Ashland; Vernon, from West End to Walton, and Jefferson, from Chouteau to Lafayette. Some of these streets, like Chestnut street downtown, which is only 36 feet wide, are narrow and congested, and the traffic, being contracted, is very heavy. On Chestnut street from 3,000 to 4,000 heavy teams pass each day. Much of the World's Fair hauling was done on West Pine, where from 700 to 800 three and four horse teams gave the granite bituminous pavement the severest possible test, and the results have been all that the company claimed they would be. Unlike other cities, there is no restriction against hauling on the boulevards in St. Louis, and the pavements on all the streets have had usage that would cause paving that was inferior to very soon betray that fact, but in no case has the granite bituminous preparation shown any signs of breaking up or decaying.

The pressure against the tar bitumen and of the tar bitumen against the granite particles is from below and above, and the greater the pressure the better it is for the compound, each piece of granite fitting closely in its bitumen bed.

ECONOMY IN MACADAM CONSTRUCTION

Common Sense in Macadam Street Building—Pointers from an Expert of Many Years' Experience—Methods Described

By Howard H. Gross

IN few fields of human activity have there been expended more money and more brains, with less to show for it, than in the matter of street pavements.

It is strange that one of the most perplexing problems of the age should seemingly be so simple that half the men you meet will assume to solve it offhand by declaring that this, or that, pavement is the only one to use.

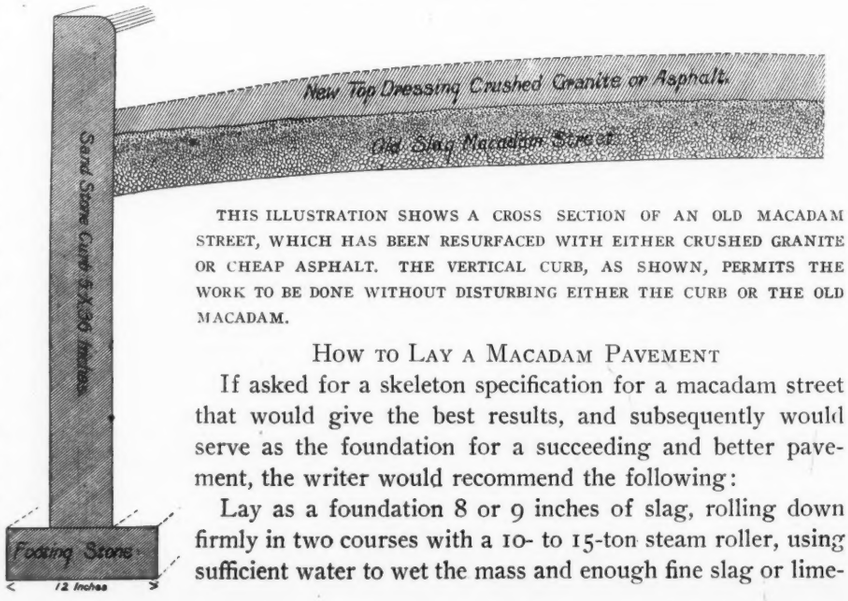
EXAMPLE OF BAD PRACTICE.*

Climate, soil and traffic conditions vary to such extremes that probably no one, or perhaps two, pavements will ever be found that will prove satisfactory under all conditions. The nearest approach to an ideal and universal pavement the writer has ever seen was laid in Melbourne, Australia, of Jarrah wood blocks; Eucalyptus blocks are, also, used there with fair success. American conditions and materials interest us most, and these will be considered.

In our country, where cities grow quickly and where rapid transit is scattering our urban population over wide areas in seeking fresh air and cheap homes, it is manifestly impossible in many localities to put down, at first, the more expensive and permanent pavements, such as asphalt or brick. The property will not justify it, and the people cannot afford it while paying for their homes. It is, therefore, wise and customary to lay some form of a macadam pavement to serve as a pioneer improvement, with the expectations that ten or fifteen years later it will be replaced with a better one. As probably more macadam pavements are laid than any other one kind, the subject of their construction is of importance. This is especially true when they can be so built that when worn out as a pavement they can be used as the foundation of the succeeding pavement, and a large part of the cost thereby saved. The following suggestions are made with this in view, and they are based upon a wide and varied experience, and scientific investigations covering ten years:

THE FOUNDATION THE FIRST REQUISITE OF A GOOD PAVEMENT

A very important feature of any pavement is the *foundation.* Unless this is well made, of good material and sufficient thickness, the pavement will not last. Quite at variance with the rule, that the best material for a given purpose costs the most, the fact is, as to pavement foundations, the cheapest is in this market (Chicago) by far the best. Blast furnace slag for this purpose possesses some extraordinary qualities. It is cheap, indestructible, grows better with age, bonds itself, resists frost, and makes the best and most enduring foundation known to the art. The writer recalls Archer avenue, Chicago, where last year slag was dug up which had been down forty years. The material was sound throughout, and so firmly were the pieces joined that the fractures from the blows did not as a rule follow the join. Slag has a natural bonding, or cementing affinity, and may be used without cement in foundations for pavements. An excellent grade of cement, equal to Portland, is being made in large quantities from slag. When this product has been thoroughly exploited and the public is informed of its excellent quality, it must come into general use.


New Top Dressing Crushed Granite or Asphalt
Old Slag Macadam Street
Sand Stone Curb 6 X 20 Inches
Footing Stone
12 Inches

THIS ILLUSTRATION SHOWS A CROSS SECTION OF AN OLD MACADAM STREET, WHICH HAS BEEN RESURFACED WITH EITHER CRUSHED GRANITE OR CHEAP ASPHALT. THE VERTICAL CURB, AS SHOWN, PERMITS THE WORK TO BE DONE WITHOUT DISTURBING EITHER THE CURB OR THE OLD MACADAM.

HOW TO LAY A MACADAM PAVEMENT

If asked for a skeleton specification for a macadam street that would give the best results, and subsequently would serve as the foundation for a succeeding and better pavement, the writer would recommend the following:

Lay as a foundation 8 or 9 inches of slag, rolling down firmly in two courses with a 10- to 15-ton steam roller, using sufficient water to wet the mass and enough fine slag or lime-

* The above cut shows a limestone macadam street, with a combination curb and gutter. The pavement has been down between seven and eight years. The storm water, instead of reaching the sewer, as intended, through the opening shown, lodges against the edge of the gutter, where it is held until it seeps through and saturates the sub-grade, causing the macadam to give away, as shown in the illustration. Not infrequently the curb is moved by the frost after the street is finished.

stone screenings to fill the voids. Continue the rolling until the slag is firmly in place, and when finished will measure, say 6 inches deep at the curb and 9 inches in the center of the street. Upon this surface spread crushed granite or trap rock, the layer being 3 inches deep at the curb and 4 inches deep in the center of the street; wet the surface and cover with about an inch of fresh limestone screenings, or bonding gravel, using only enough to fill the voids, roll the surface thoroughly until the whole mass is firm (remember that "rolling makes the road"); remove the roller and spread upon the surface of the street half an inch of coarse granite screenings, and leave it to be incorporated with the mass by the traffic. A street thus built in a residence or suburban street should give good service for 12 years or more.

WHEN NOT TO USE COMBINATION CURB AND GUTTER

Never use a combination curb and gutter with a macadam street. It is almost impossible to spread the macadam so that it will roll down "just right" and so that it will meet after compression the gutter surface. If the street finishes too high the macadam spreads into the gutter and is swept by a heavy rain into the sewer; if, as is more often the case, the macadam is too low, the water flows under instead of over the gutter and instead of reaching the sewer it soaks up the street and sub-grade, and the street goes to pieces. The accompanying illustrations show examples of this. If the soil is mucky or clayey, or the street has been "filled," the heavy steam roller will usually heave the gutter out of place and cause no end of trouble. This is particularly true in rainy seasons.

Where a combined curb and gutter has been put down with a macadam street, it cannot be used as the curbing with a subsequent pavement for the double reasons that the edge of the gutter will be so broken and disfigured that it is unfit to remain, and the surface of the new street, built upon the old foundation, will not *exactly* agree with the surface of the first pavement. It will usually be from ½-inch to 2 inches higher, and, therefore, does not meet the gutter surface.

The most satisfactory curbing in the central part of the United States is what is known as Ohio sandstone. It is 96 per cent. pure silica, and when seasoned and set will last a lifetime.

When a macadam street, curbed and laid as above suggested, becomes so old and worn that it should be removed, it may be washed clean and asphalt spread over the surface, leaving the curbing and slag in place, and the result will be a saving of 40 per cent. of the expense, and the rebuilt street will be better than if all the material and work were new.

CONVENTION OF WATER WORKS EXPERTS

THE twenty-third annual convention of the New England Water Works Association was held at Holyoke, Mass., on September 14. The attendance was about 300, including several women. There were addresses of welcome from Mayor A. B. Chapin, of Holyoke; President M. H. Whitcomb, of the Holyoke Business Men's Asociation, and Chairman John J. Sullivan, of the Holyoke Water Commissioners. President E. C. Brooks, of the Water Works' Association, presided and expressed deep gratification at the cordiality of the greetings extended the visitors.

There was a display of exhibits connected with water works which included exhibits from the Chapman Valve Manufacturing Company, Henry R. Worthington, A. P. Smith Manufacturing Company, Holyoke Valve and Hydrant Company, The Norwood Engineering Company, R. D. Wood & Company, Pittsburg Meter Company, Neptune Meter Company, Merrill Water Works, Wakefield Lead and Iron Pipe Company, Greenwood & Daggert Company, Union Water Meter Company, Thompson Meter Company, Park Packing Company, Hersey Manufacturing Company and H. Mueller Manufacturing Company.

In addition, the Deane Steam Pump Division of the International Pump Company had a private exhibition in one of the hotel chambers, which attracted much attention among the delegates.

Papers were read on "The History of the Holyoke Water Power Company," by A. F. Sickman; "Up to 1895—Some Reminiscences," by R. C. P. Coggeshall, of New Bedford; "The Additional Water Supply of New York," by Rudolph Hering; "Municipal Water Supply Revenue," by James L. Tighe, of Holyoke; "The Epidemic of Typhoid Fever at Ithaca, N. Y.," by George A. Soper, of New York City; "The Use of Superheated Steam in Pumping Engines," by E. H. Foster, New York City; "Bog Fuel," by Edward Atkinson, of Boston; "The Norwich Compressed Air Plant," by J. H. Shedd, of Providence, R. I.; "The Holyoke Water Supply," by Water Commissioner J. M. French; "Description of the Haskell Brook Reservoir Dam," by H. W. Spooner and the "Direct Pumping Method of Water Supply in Use in Taunton," by G. A. King.

An object of great interest to the visitors was the new high pressure reservoir near Ashley ponds, begun five years ago and just finished. The structure represents an outlay of $130,000 and covers an area of 65 acres. The storage capacity of the basin is 350,000,000 gallons. The deepest point in the reservoir exceeds 17 feet, which is the average depth. The new structure will require from 60 to 90 days to fill, as only overflow water will be used, and the water will be let into the reservoir immediately. The pressure in the Highlands will be increased about 40 pounds, making the total pressure 80 pounds.

By special arrangements the delegates and other visitors were privileged to inspect the plants of the Coburn Trolley Track Company, in Williamsett, Holyoke Machine Company, Holyoke Water Power Company's dam and canals, Holyoke Steam Boiler Works, street-railway power house, Holyoke Valve & Hydrant Works, J. & W. Jolly Shops, Lyman Mills, National Bank Book Company, George W. Prentiss & Company's Wire Works and Whitmore Manufacturing Company; Parsons Paper Company, Whiting Paper Company and Carew Manufacturing Company, Riverside No. 2, Crocker, Albion and Linden Divisions.

UNIFORM MUNICIPAL BUILDING LAWS

An International Society of States and Municipal Building Commissioners and Inspectors Organized for Promoting Uniformity—Headquarters in Washington, D. C.

By F. W. Fitzpatrick, Secretary-Treasurer

This Society was organized on the 23rd of February last. Nearly 200 cities had expressed interest in the movement. The first convention was held in Washington at the call of the temporary committee on organization, and after adopting a constitution, elected the following officers: Mr. James Mulcahy, Building Commissioner of Boston, president; Mr. G. U. Heimburger, Commissioner of Building, St. Louis, vice-president; Mr. Henry Rumrill, Jr., Deputy Building Commissioner of Buffalo, second vice-president; Mr. F. A. Pitman, Building Inspector of Atlanta, third vice-president; Mr. James G. Houghton, Building Inspector of Minneapolis, fourth vice-president; Mr. Robert McCallum, City Architect of Toronto, fifth vice-president; Mr. Alcide Chausse, Inspector of Buildings of Montreal, sixth vice-president; Mr. F. W. Fitzpatrick of Washington, secretary-treasurer; and Messrs. F. L. Brown, Superintendent of Building Inspection, Scranton; F. H. Ellerbe, Deputy Building Inspector, St. Paul, and Mr. C. B. Cooke, City Engineer of Wheeling, as an executive committee.

Purposes of the Organization

The purposes for which this Society was organized are to secure a closer and more personal relationship between the representatives of the building departments at home and abroad; to secure more uniform building laws in all the states and cities; to collect from every source information relating to building matters, tests, etc., and the dissemination of that information among those forming part of this Society; concerted action toward the advancement of the sciences of construction and particularly the adoption by states and municipalities of means to secure, as far as practicable, the prevention of loss of life and property by fire.

While, of course, the greater part of the time of the convention was taken up with the organization of the Society and mapping out a general plan of action, some time was devoted to the discussion of building laws, changes that were advisable, and precautions to be taken against fires in cities. The mere association of a body of men in the same line of endeavor is most beneficial, and the exchange of ideas, even during so brief a space of time, will result in very great good to the cities represented.

Regulation of Theater Construction

Naturally theaters and their protection was one of the main topics of discussion at that convention and has since then occupied much of the members' attention. Some cities have already incorporated in their building ordinances provisions to the effect that all stage settings shall be coated with some kind of approved fire-retarding paint and, in fact, that the scenery be made thus and so. It can readily be seen how difficult it will be for traveling companies to conform to half a dozen radically different ordinances, and it was decided to study out some scheme of protection that might be suggested for adoption by all the cities, a standard to which it would be easy for traveling companies to conform and thus be in shape to present a play, in any city, without having to go through special and unnecessary precautions simply to conform to the different wording of ordinances. At present very few cities agree in their ordinances as to the fiber strains allowable in building materials, the thickness of walls for different stories of buildings, the loading capacity of floors in different classes of buildings, and all such points. The Society intends making numbers of tests in those particulars and adopting certain standards for them, and recommending their incorporation in the building ordinances of all the cities.

One of the striking features of the discussions has been the general tendency to discourage hampering legislation concerning building. The revoking of very many existing ordinances and the substitution therefor of fewer but better rules seemed to be one of the principal objects desired. The idea is to do absolutely nothing that may discourage people from building or that might work hardship upon investors, but to encourage saner notions in construction, and therefore safer and better buildings than we are getting to-day, though not one whit more expensive to construct.

Experts in Many Lines Will Be Consulted

It is planned to invite the highest authorities and experts in the various building lines, engineers of international fame, chemists, and others who give much time and study to the strength of materials, their durability, fire-resisting qualities, etc., to submit papers and opinions on all these varied subjects. Lawyers will be invited to assist in the general revision of the building codes and the standardizing of building laws and regulations. Steps have already been taken to collect the ordinances referring to buildings from every city in the Union and in Europe. From all of these regulations the best of each will be extracted and incorporated in the standard ordinance that will be suggested to all the cities. A simple code will also be drawn up for towns of minor importance where there is no building department, regulations that the Mayor, or constable, or other town officer may be guided by, so that even in those small places—often the nucleus of large cities—buildings may be of a higher calibre. Poor construction is more often the fault of ignorance than it is of intentional wrong-doing.

One of the things that is being urged by the Society is that not only shall there be sufficient regulation for theaters and other "dangerous" buildings, but that there shall be frequent fire drills of theatrical employées, ushers in churches, clerks in department stores, etc., so that in case of panic or alarm in any such place there can be an intelligent direction and handling of the crowds, as well as a minimizing of the danger to the people.

The Use of Fire Escapes

The exterior and customary form of ladder fire-escape is not looked upon with favor by the Society. Every one knows that in case of a scare, particularly in an apartment house or where people sleep, one's first idea of egress from the building is by way of the ordinary and usual ingress. Therefore does the Society deem it advisable to encourage the building of the usual stairways in all such buildings enclosed in fire-walls, with self-closing doors at every landing, doors that must never be blocked or fastened open under the severest penalty, and connecting with a direct passageway or lobby to the street and without any connection whatever with the basement, where there are usually storerooms, heating appliances, etc., and where usually, in such buildings, fire originates. Such a form of stairway, open to the roof and thoroughly ventilated, would form the very best, easiest, and most natural means of escape from all such buildings. The elevator shafts would likewise be enclosed in fireproof partitions, instead of the open-work grills that are common today and that add so little to the appearance of a building. If it is desired to have those elevator wells ornamented and lighted, then the metal grill should be worked in with wired glass, so as to close up, story by story, as much as possible, and cut off the drafts that carry fire and smoke from basement to attic before people have time to think about getting out of a building.

Department stores are receiving the attention they merit. It is natural that people building these should insist upon having as large floor area as possible, and it seems unreasonable to have to cut up such a store with fire-walls every twenty-five or fifty feet. Then, too, most of these stores have large open areas through the center for lighting. Shelving is piled high with the most inflammable of materials, and it is only a question of time when some such store, crowded with thousands of people, will furnish a terrible example of what fire may do in a building of that character. It is being urged that only the most perfect of fireproof construction be used in such buildings; that the finishing and decoration in wood be discouraged and the use of metal and plastic decorations exclusively be insisted upon. Ample hose provision and automatic sprinkling systems should be installed and all the clerks drilled in the use of fire extinguishing appliances. Enclosed stairways, and many of them, should be provided, and means of rapid egress in many directions.

Timely Literature to Be Sent to All Cities

All of these suggestions are to be elaborated upon and printed, and sent out to all the cities that the latter may incorporate them in their existing ordinances, even before a standard ordinance is gotten up and submitted to them.

The Association of Fire Chiefs and Police Chiefs have done splendid work, and the National Bureau of Identification, in connection with the latter organization, has become so valuable that the departments now wonder how they ever got along without it. It will take but a little while to demonstrate that this Society of Building Commissioners and Inspectors was an absolute necessity, and that its work is returning a thousandfold the insignificant sum contributed by each city, in the shape of dues for its Chief Building Officer, toward its support. The Association of Fire Chiefs has tended greatly to the betterment of that service in fighting fire. One of the objects of this Society will be to lessen the possibility of fire—fire prevention in other words—and its resultant effects will be the decreasing of the cost of fire departments and the greater immunity of cities from the terrible loss of life and property by fire that has obtained in this country, and particularly of late. The one feature, if nothing else were attempted or even thought of, would warrant the enthusiastic support of the Society.

Good Results Expected

The improvement of building methods, of building laws, and their more intelligent and vigorous enforcement in cities, will not only benefit the body corporate but will be of distinct personal and tangible advantage to every citizen, so that this is an organization that should appeal not only to the official representatives of the people but to every intelligent man dwelling within a municipality.

The organizing of the Society on international lines, thus widening its scope of effectiveness as well as greatly increasing its means of getting information, redounds to the greater advantage, naturally, of every city here and abroad represented in the Society.

While, of course, the Society depends upon its members for the gathering of information, record of tests of building materials, and all such matter, it invites, and will most gratefully receive, any matter of that kind, suggestions, advice, and data from anyone and everyone who may take interest enough in the public weal to give himself the trouble to communicate such information, etc., to the officers of the organization.

WHEN STREET RAILWAY TRANSFERS ARE NOT VALID

In the case of Hornesby versus Georgia Railway and Electric Company, the Supreme Court of Georgia has decided when a transfer is valid and when not. If a street railway allows its passengers to transfer from one car to another and continue their journey without an additional fare, it is reasonable to expect the passengers to observe certain rules, in regard to the use of the printed transfer. When the passengers board the second car, if the time limit on the transfer has run out and they cannot prove that it is the fault of the first conductor and if they refuse to pay the fare, they cannot collect damages if they are ejected from the car. When the car is delayed and passengers holding transfers attempt to walk to the transfer point, if the time limit expires before they get there, they cannot collect damages from the company. In a case of that kind their place is to stay on the first car and have the conductor make arrangements so that they will receive the benefits of the transfers.

MUNICIPAL JOURNAL AND ENGINEER

Published Monthly by

THE MUNICIPAL JOURNAL PUBLISHING COMPANY

253 Broadway, New York

WILLIAM S. CRANDALL, - - - - - - Managing Editor
EMIL KUICHLING, C. E., - - - - - - Engineering Editor

JOHN B. BENNETT, - - - - - - - - Business Manager
JAMES H. VAN BUREN, New York, - - Eastern Representative
J. M. SCHLOENBACH, Chicago, - - - Western Representative

TERMS OF SUBSCRIPTION

(Payable in Advance)

United States and Canada	$3.00 per year
Foreign Countries	3.00 "
Single Copies, each	.25

Special rates given for clubs of ten or more.

Make all checks payable to The Municipal Journal Publishing Company

Entered at the New York Post Office as second-class matter

NEW YORK, OCTOBER, 1904

Controlling Public Utilities

Eternal vigilance is the price not only of liberty, but it is the price, also, of human advancement. Let us say, rather, that it prevents the world from slipping backward after valuable advancement has been made. If, for instance, we could imagine a great municipality which had fought its way out of the clutches of corporate greed to the liberty of control of public utilities—if we could imagine such a city falling back again into the danger it had escaped, it would be an indication of the failure of that vigilance whereby, alone, mankind can enjoy the success and advancement it has won.

Since the eldest son of the first man "builded a city" the parasite in the shape of corporate cupidity, has fastened itself upon most municipalities and the process of shaking themselves free from commensal conditions that have become insupportable, has been the greatest problem with which cities have had to cope. The effort of communities to throw off the irksome thralldom of the State has been successful. The comparison of modern home rule among cities with that condition of the Greek mind which identified the State and city so completely that the language has but one word for both, shows clearly what can be done when the inhabitants of cities awake to a knowledge of the value of perfect civic conditions.

Municipal control of public utilities is so obviously a desideratum that if it were as easy to accomplish in practice as it is in theory, the problem would be a very simple one. In practice, however, the drawbacks have proven to be many and difficult to surmount. Lack of public intelligence and inertness of the civic conscience have added complications to an otherwise simple problem. "A great city is that which has the greatest men and women" and in such a city after its government obtains control of its public utilities, the people must maintain control of the government.

The growth of public ownership in the cities of the United States, while gradual, is continuous and persistent, according to the annual report of the United States Department of Labor for 1899, of the water works, 1787, or 53.7 per cent.; of the gas works, 14, or 1.5 per cent.; of the electric light works, 460, or 15.2 per cent., were owned by the municipalities. These municipal plants represented 67.5 per cent., 0.6 per cent., and 4.6 per cent. of the estimated total investment in water works, gas works, and electric light works respectively. It is obvious from these figures that municipal ownership of water works is relatively more common in the large cities than in the small ones, while the reverse is true with regard to electric light works.

The law of logic which has hitherto regulated the utilities owned either publicly or privately has never been formulated. No city in the United States owns a street railway or a telephone system—with the exception of the Boston and New York Subways—yet of sewerage systems there were in 1902 but 47 private systems out of 1096 reported in the Municipal Year Book. The supply of water is generally assumed to be a natural municipal function, yet it is difficult to see wherein public ownership of water comes under a different tale of logic than the municipalization of street railways, lighting plants or telephone systems. The explanation may lie in the fact that, comparatively, few large cities have the right, under their charters, to acquire or construct street railways, lighting plants and telephone systems. There are exceptions to this rule such as San Francisco, Portland and Denver, which cities are granted authority in the matter of public ownership by the legislatures of their respective States. It is a gratifying fact that many commonwealths specifically forbid in their constitutions, the legislatures' granting any special or exclusive privilege by special act. In the constitution of South Carolina, adopted in 1895, one article provides that "no law shall be passed by the General Assembly granting the right to construct and operate a street or other railway, telegraph, telephone, or electric plant, or to erect water or gas works for public uses, or to lay mains for any purpose without first obtaining the consent of the local authorities in control of the streets and public places proposed to be occupied for any such or like purposes." When articles like this are incorporated in the constitutions of the bulk of our States, we shall have made much progress toward public ownership. Colorado and Virginia may be said to be the two States that have taken the most advanced ground in regard to the control of franchise grants. Fortunately, the old method of legislation whereby ordinances were passed by a majority vote of the City Council, acting without limitation upon their power or procedure, is giving way before the more enlightened legislation, which points the way to the control by cities of their public utilities.

In Germany, as Dr. Shaw has pointed out, the question of municipal ownership is settled in each particular case on its merits as a business proposition. It would be impossible for the United States to approach the question purely from a European standpoint for the reason that here we have equal

manhood suffrage and the citizens' personal right to life and liberty is superior to the rights of vested property. Close business policy, therefore, is not the first requisite in the operation of a franchise in American cities for the reason that with us the franchise question is necessarily political and has to do with the general welfare of citizens.

In conclusion we cannot do better than to follow the advice set forth by Dr. Delos F. Wilcox in his work on The American City. He says:

A correct franchise policy, consistent with democracy, and practicable under existing conditions, would involve the following points:—

1. Insist that every public utility now owned and operated by a city should be conducted on clear-cut principles, and should render an unmistakable public account of itself.

2. Compel all public utility operators dependent upon special privileges in the streets, to make frequent detailed reports of their financial affairs to the city authorities.

3. Secure by legislation or by constitutional amendment, if necessary, the right to the city to own and operate all public utilities, and to acquire existing utilities by purchase or condemnation proceedings.

4. Tax franchises to the limit of their value and make use of all legitimate powers of government to prevent and correct over capitalization.

5. Make all new franchises terminable at any time, reserving the right to the city to purchase the plant and general outfit at an appraised valuation.

6. Give the electors the right to control the grant of franchises by direct vote by means of the optional referendum.

7. Adopt the policy that whether under private control or public management a franchise should be so conditioned as to have no monetary value; that is to say, keep prices down to the cost of service, and destroy by public control the advantages of monopoly.

Criminal Stupidity and Impure Water

FROM various cities throughout the country comes the cry that typhoid fever is increasing and coincidentally the fact that the city so afflicted is for some reason the victim of impure water. The relation of impure water to typhoid is so well known, that it is amazing to think of the criminal stupidity in civic officials and the difference of citizens who allow them to continue serving foul water to the community.

From Newton, Mass., comes the report that there is an epidemic of typhoid fever there which is directly attributable to the condition of the water which the citizens have to drink. The water in the artesian wells along the banks of the Charles River at Newton Upper Falls, the low condition of the river itself and the small amount of water in the conduits are believed by many people to be the cause of the trouble. According to the daily press there is an epidemic of typhoid fever, also, at Jamestown, N. Y., and the cause is justly attributed to bad water.

Philadelphia is another case in point. The August return of the Bureau of Health showed 454 cases of typhoid, while July had 257, thus showing a marked increase in the disease. The newspapers of the city looked into the matter and discovered that a mixture of filtered and unfiltered water was being served in a section of the city, thus tending to spread the danger. Those rapacious monuments of cupidity and stupidity which Providence—and Philadelphia—for some inscrutable reason allows to misgovern the city, were appealed to with the usual result. What did or does such officialism as afflicts Philadelphia care for the public health? After considerable more than $3,000,000 had been expended on a filtration system and the plant was declared to be in operation, the citizens of West Philadelphia, were naturally indignant when warned by the health and water officials to boil the water before drinking it. Their dream of pure water for which they had paid so lavishly, was followed by a rude awakening, according to the *Philadelphia Record.*

"Then came the discovery that the costly system was inadequate to supply the 33,000,000 gallons a day that is used west of the Schuylkill. The output of the filter beds was found to be short about 2,000,000 gallons a day, and to make up the deficiency that amount of unfiltered water from the George's Hill reservoir was mixed with the filtered article and distributed through the service pipes. This so-called pollution raised a howl, and the rosy dreams of West Philadelphia were rudely shattered by the 'Boil your water' cry of the typhoid fever alarmists."

It appears that the water was not the only thing that was mixed. The wise officials at first flatly refused to "unmix" it and then, bowing slightly to public opinion, concluded to stop the mixing proces and serve filtered water to some citizens and unfiltered water to others. Again, to quote the *Record*:

"Now comes fresh cause for complaint. Water Bureau officials have decided to stop mixing the water, and as soon as a few connecting pipes and valves can be put in place one-sixteenth of the people of West Philadelphia will be again supplied with the unfiltered article. Chief Hand is having the necessary work done, but is very carefully concealing the boundaries of the section to be cut out of the filtered water service, and the secret may not be revealed until after the election, as in some sections of West Philadelphia the people have a habit of voting independently at times. All this agitation is naturally pleasing to the manufacturers of what are known as 'preliminary filters,' which the water officials admit, will have to be installed at the Belmont plant before a sufficient supply can be assured the long-deluded people west of the Schuylkill.

"Several months ago bids for a 'preliminary' plant were opened by the Department of Public Works on plans made by Chief Hill, but for some reason the bids were rejected. A subsequent explanation made by Director Costello was that individual bidders had submitted bids on private plans. These plans were, it is said, for patented processes and did not meet with Mayor Weaver's approval. According to Chief Hill: 'The preliminary filters at Belmont and elsewhere are intended to do in a short time what would be accomplished only in a very long time by plain subsiding reservoirs.'

"It is proposed to again advertise for bids for this important preliminary filter to be installed at Belmont, and by the time the contractors get every possible cent out of the game all of West Philadelphia may get filtered water."

It is pleasant to turn from this picture of misgovernment to such towns as Nashville, Tenn., where a wise and far-reaching filtration bill has been favorably reported to the Council, whereby the citizens will, before long, be in possession of a daily supply of twenty-four million gallons of pure water per day.

The importance of a plentiful supply of pure water for cities cannot be over-estimated. It takes precedence over all other wants of a town. It is the first municipal matter to consider and it may be stated as an axiom that a city that has pure officials will also have pure water.

♣

Frightful Accident with Dynamite

It is little short of criminal for any municipality to use or to permit the use of dangerous explosives within city limits, when the non-dangerous explosives can be substituted. The frightful accident at Melrose, Mass., on September 21st, when nine persons were killed instantly, a score of others so badly injured that they had to be taken to the hospital, and the injuring of a score more of passersby, is the worst of the long list of fatal accidents which has occured this year.

According to the press account the local expressman had placed two fifty-pound boxes of dynamite on the tailboard of his wagon for immediate delivery. In crossing the street car track on one of the main streets one of the boxes was jarred off and landed on the track unnoticed by the driver until he had arrived at the destination of the dynamite, a block or so away. Realizing the danger the driver hastened back over his route and at some distance saw the missing box on the track and a trolley car loaded with people approaching at high speed. The driver made frantic efforts to attract the attention of the motorman but failed to avert the disaster.

This sacrifice of human life would have been impossible if what are known as the non-dangerous explosives had been used. There are several brands of these explosives, all of which have been thoroughly tested both as to their efficiency for the purpose intended and also as to their safety, and proven to be perfectly satisfactory. These explosives can be handled or transported to any point with perfect safety. With this sort of high power explosives to substitute for the dangerous dynamite it is worse than folly for municipalities to continue to permit the use of the latter. This is an excellent opportunity for the mayors and aldermen of every city to get together and frame an ordinance which shall call for the use of the safety explosives only.

♣

Topeka Talks of Lowering Salaries

The newspapers of Topeka are discussing the question of a cut in the salaries of the city officials. At present all the officials in the employ of the city who receive $1,000 or over are as follows:

"City Attorney, $1,800 per year; Fire Marshal, $1,650; City Engineer, $1,620; Mayor, $1,500; City Clerk, $1,500; Election Commissioner, $1,200; City Treasurer, $1,200; Street Commissioner, $1,020; Plumbing Inspector, $1,000; Chief of Police, $1,000; Superintendent of Light Plant, $1,000."

The aggregate of these munificent (?) salaries, and those of officials who receive less, amounts to $120,000 per annum. The proposition is to reduce these already too small salaries by 10 per cent. This would mean a paltry saving of $12,000 per year.

In consideration of the fact that the total municipal assets of Topeka in 1902 footed up to about $1,200,000, this is an exceedingly small move to make on the part of this prosperous city. In the same year the net debt, per capita, was $31.92; the assessed valuation of real and personal property was $300 per capita. The total expenditures of the city, in the same year, for maintenance amounted to $9.38 per capita, as compared with $16.45 and $28.71 for the two cities next larger and smaller in population, Malden and Newton, Mass.

We do not hesitate to say, that, instead of seeking to reduce the salaries, Topeka should increase them. It is absurd that the highest salary paid to any official of a city the size of Topeka should be only $1,800! It is more absurd that the mayor should receive only $1,500 per year, and that his should be fourth in the order of amount of salary received!

What is the matter with Topeka? Is she poverty stricken, or are the newspapers giving the outer world a wrong impression? In any event, it is a bad policy to cut salaries, especially when they are already too low.

♣

Editoral Comment

It would be a sign of progress if more of our American cities would adopt the combination system of street cleaning by hand and machine, which has long been popular in England. One machine will do more and better work per day than many men.

♣

On an average, one person per day is either killed or maimed for life in the streets of New York by the street car, automobile or truck, and yet it is a rare thing for the offender to be punished with more than a small fine. Under such conditions reckless disregard of human life is more apt to increase than to diminish.

♣

The public utility corporations of New York own the city and make the people pay exorbitant rates for their services. For example, New York pays $1.00 per thousand cubic feet for gas which costs but 17 cents to manufacture; $66 per year for limited telephone service when London gets an unlimited service for less than half the price; and 5 cents for a 2½-cent ride on the street car, half the time without a seat. New York has become so accustomed to corporate extortion that it submits with all the meekness of habit.

♣

In European cities, the public service corporations consider themselves lucky to get a reasonable dividend on their unwatered capitalization, while in America they think themselves illtreated—not to say impoverished—if they don't own the town! In Europe the corporation is the servant; in America it is the master.

♣

One of the best investments which could be made by the average town and village is a road roller and stone crusher. The New England and Middle States have realized this for many years, while the South and West are just waking up.

THERE are two kinds of civic reformers: The "shoddy" and the "all wool and a yard wide." The former affects to be "arrayed in gold and costly apparel" constituting the froth of society, while the latter is inconspicuously clothed, forming the great mass of society located between the froth and the dregs of humanity, and is the salvation of the Republic. And yet, with the majority of chances in its favor, none too much honesty is found in the administration of any city's affairs.

IT is rumored that there is in certain quarters a sentiment favorable to the sale of the Reading, Pa., Water Works in the near future. The water works belong to the city and the sale of them to a corporation would be worse than a mistake; it would be actually criminal. The people of Reading should get together and stop this premeditated outrage at its inception.

THE same thing is threatened in Lancaster, Pa., with regard to the water supply there. The water plant—as the local paper says pathetically, is all that Lancaster has left except the City Hall—may not only be sold, but under conditions whereby the city may have to pay a large sum to the recipient for taking it over. It is most earnestly to be hoped that this civic infamy will be nipped in the bud and that Lancaster will retain the only franchise that has not been stolen from her.

THE Georgia Railway and Electric Company, which runs its cars in the streets of Atlanta, Ga., recently held the city up for $1,200, on the ground that the street railway company should not be made to pay anything toward paving on streets where the paving is not put down on the assessment plan. The representative of the railway urged that the ordinance requiring them to do so be repealed.

It is a great pity that the Atlanta Street Committee paid any attention to this claim. Street railway companies can well afford to pay their share of the street paving. Subterfuges to avoid such payment should not be tolerated by municipalities.

THE City of Shreveport, La., which is both enterprising and enlightened as a community, has started a crusade in favor of good roads. A good roads convention was recently held there at which State Superintendent J. B. Aswell declared that good roads and good schools must go together.

Colonel Richardson, of the office of Road Inquiries, Washington, said that the final result of the preliminary good road building now going on throughout the country would be State aid and then national aid. He said that the people through their representatives should urge for State and Federal aid, and we would get it. Some of the Eastern States, notably New York and Massachusetts, are already furnishing State aid for the building of good roads. In answer to a question from Prof. Aswell, he said that Massachusetts was now paving three-fourths of the cost of all good roads constructed. He told, however, how 92 per cent. of the people of that State lived in towns.

It is pleasant to note the progress of towns like Shreveport, which are always in the front rank of municipal progress.

A RESOLUTION was recently introduced in the Common Council of Norfolk, Va., having for its purpose a complete change in the laws governing the water department of the city and bringing that department more directly under the jurisdiction of the Council. This is a mistake. The experience of cities has shown that their interests are best subserved by having the water supply in the hands of a Water Commission, which is responsible to the city as a whole and not to any changeable body of politicians.

THE local Board of Health of Columbus, O., has formally endorsed the crusade against the smoke nuisance in that city. The authority of the Health Board to regulate this matter has been questioned, on the ground that smoke is only a source of discomfort and inconvenience, and not a menace to health. It would, however, be amenable to police regulation, if nothing else. But the health authorities think there is enough of a menace to health in smoke and soot to bring it to some extent within their purview.

This is undoubtedly the correct view of the question. If a Board of Health is not competent to abate a nuisance, its title becomes not only a misnomer, but reduces its functions to a farce.

Convention Dates

OCTOBER

—International Engineering Congress will meet October 3-8, at St. Louis, Mo., under the auspices of the American Society of Civil Engineers. Secretary, Charles Warren Hunt, 220 W. 57th street, New York.

—League of American Municipalities will meet in seventh annual convention at East St. Louis, Ill., October 4-6. Hon. John MacVicar, Secretary, Des Moines, Ia.

—The American Society of Municipal Improvements will meet at St. Louis, Mo., October 4-6, at Grand View Fraternal Hotel. George W. Tillson, Secretary, Municipal Building, Brooklyn, N. Y.

—American Street Railway Association, American Railway Mechanical and Electrical Association and Street Railway Accountants' Association will meet at St. Louis, Mo., October 10-15.

—American Gas Light Association will meet at Washington, D. C., October 19-21. Secretary, A. E. Forstall, 58 William street, New York City.

—American Society of Civil Engineers will meet at St. Louis, Mo., October 3-8. Secretary Charles Warren Hunt, 220 W. 57th street, New York City.

DECEMBER

—American Society of Mechanical Engineers will hold their annual meeting at New York City, on December 6. Secretary, F. R. Hutton, 12 W. 31st street, New York City.

JANUARY

—The American Public Health Association will meet at Havana, Cuba, January 2-6, 1905. Dr. Charles A. Probst, Secretary, Columbus, Ohio.

Personalities

—Mr. A. R. Holcombe was elected Mayor of Jackson, La., on September 5.

—The resignation of Mr. Charles J. Carney as President of the Board of Water Commissioners of Dunkirk, N. Y., has been noticed.

—Mr. John A. Keinle has accepted the appointment of Assistant Engineer for the construction of the water works that are to be erected at Wilmington, Del.

—Mayor Fobes, of Syracuse, entertained the mayors of many cities of New York State on September 9. In the morning the mayors held a session in the Common Council chamber. Mayor Fobes said he had invited them to help him keep the "lid" down tight during the State Fair. Mayor Cutler, of Rochester, spoke of the difficulty of restraining suburban railroad companies in their occupation of the city streets. In the general discussion, which was led by Mayor Charles H. Gaus, of Albany, there was a unanimous acceptance of Mayor Cutler's views. After the conference the mayors went to the fair grounds in automobiles. They were entertained at dinner at the Century Club as guests of D. M. Edwards, and later in the evening reviewed the automobile parade.

—Dr. George G. Graessle has succeeded Dr. J. M. Shields as Mayor of Seymour, Ind. The new Mayor is a Republican and his predecessor is a Democrat. Dr. Graessle is a prominent physician. He is a son of the Rev. Andrew Graessle and spent a part of his boyhood days in Louisville, being a graduate of the Louisville High School.

—The special election for the purpose of choosing officers to conform with the change of government from that of a village to a city, under which Luverne was recently incorporated, was held September 7. The officers elected are: E. A. Brown, mayor; E. C. Schwartz, recorder; A. Ross, treasurer.

—Mayor Rolla Wells, of St. Louis, Mo., has asked the Street Department for maps and diagrams of all the city's grade crossings, showing the conditions of these crossings and their equipment, with a view of determining the best method of guarding against accidents like the recent Sarah street disaster.

—Mayor T. B. Gilbert and a majority of the members of the City Council in Kansas City, Kas., have become thoroughly out of patience with the Metropolitan Water Company, because of its continued poor water and service and have announced that they favor the proposition for the city to acquire its own water works.

—Mayor Wyckoff, of Plainfield, N. J., led a posse of fellow citizens in battle on September 3, against a band of armed tramps, winning a signal victory. He is now the center of admiration of all his fellow townsmen. One of the tramps was seriously injured as the result of a previous fight among themselves.

—Mayor Coleman, of Elmira, N. Y., declined to deliver an address of welcome to the State Workingmen's Federation on September 13. At a recent banquet at the City Club the Mayor was quoted as speaking in favor of the open shop. This offended the union men and the invitation to address the delegates was barely carried. When Mayor Coleman heard of the friction he sent word declining to be present at the first session to offer the city's hospitality.

—J. Samuel McCue, wealthy and prominent, former mayor of Charlottesville, Va., has been arrested and placed in jail charged with the murder of his wife on the night of September 4. It is believed that the killing was done in a passion aroused by his being upbraided by his wife for his indiscretions and alleged unfaithfulness. The ex-Mayor denies that he killed his wife.

—Dr. W. W. Zimmerman, the mayor of Richmond, Ind., in whose office a ten-year-old baby boy was left by a masked man in August, has decided to adopt legally the little waif and to give it his name. The youngster, of whom the chief executive of the city of Richmond is very proud, will be named W. W. Zimmerman, Jr.

—Mayor Joseph Mark, of South River, N. J., was married on September 7, to Miss Clara Kessler, a pretty brunette who was employed in his factory. American flags were displayed in honor of the wedding, and immediately after the ceremony all the church bells in the village chimed gayly and the whistles on the factory plants were blown for half an hour. Mr. and Mrs. Mark have gone to the St. Louis Exposition. Mr. Mark is the senior partner in the firm of Mark & Davidson, shirt manufacturers.

—The appointment has been accepted by J. W. Howard, Consulting, Civil and Mining Engineer of 1 Broadway, New York City, to serve on the International Jury of Awards at the St. Louis Exposition. Mr. Howard was Vice-President of the Engineering Jury in Paris in 1900.

—Residents of Bayonne, N. J., were much surprised to learn on September 8 that City Treasurer Joseph Brady had been married at Mahanoy City, Pa., to Miss Maud Skeath, a school teacher of that place. Mayor Thomas Brady, of Bayonne, an uncle of the City Treasurer, was as much surprised as any one at the news. He said his nephew started on his vacation, but gave no inkling of an intention to get married. Mr. and Mrs. Brady will reside in Bayonne.

—Critics of Mayor Tom Johnson have been obliged to admit that his administration in the city of Cleveland has been phenomenally successful. Under his guiding influence that city is in the embarrassing plight of having more money than it knows what to do with. By law, the city is allowed to deposit with twelve banks as depositories, not more than $7,000,000. If the city should happen to have more than that amount of cash on hand at one time, the surplus must be tucked away some place around the City Hall, or stowed away in some safety deposit vault. Just at present the city's cash on hand exceeds this amount by $300,000. Within a few days this surplus will be swelled by $460,000, the result of a recent bond issue. Then the town will have almost $1,000,000 lying around loose. Just what to do with the money is perplexing Auditor Madigan and Treasurer Coffinberry, but it is not worrying them because the existence of that much surplus is evidence of the city's healthful financial condition.

NEWS AND PRACTICE AMONG THE CITIES

Street Improvements in Augusta--Pollution of Iowa Streams--Model Brick Pavement in Chicago--Rubber Paving in London.

Street Improvements in Augusta

During the year 1903 the City of Augusta, Ga., has put down 21,973 feet of granite curbing and 23,698 feet of brick gutters. The city has been vastly improved in appearance through the citizens looking after the "greens" opposite their houses. The tree and park commission planted out last year about 2,300 trees. They were carefully put out under the watchful care of the contractor. About 1300 of the trees promise to be permanent growers. Bids for additional tree planting are under consideration. Mayor Jacob Phinizy has suggested that an act of the legislature be passed creating a tree and park commission for the city.

Population of Moscow

According to the last official census (1902), Moscow, Russia (excluding suburbs) has a population of 1,092,362, which is classified according to native tongue and creed as follows:

According to native tongue: Russians, 1,040,929; Germans, 17,676; Poles, 10,507; Tartars, 5,315; Jews, 4,656; French, 2,732; Armenians, 1,692; English, 789; 35 nationalities, with colonies of from 10 to 200 people, 8,066—a total of 1,092,362.

According to creed: Orthodox Russians, 1,014,815; orthodox Russians (old believers), 18,110; minor religious sects, 126; Catholics, 17,050; Lutherans, 21,596; Reformed Church, 1,831; Anglican Church, 639; Armenian-Gregorian Church, 1,844; Jews, 9,049; Caraimes, 385; Mohammedans, 5,667; unclassified, 1,250.

Street Rights of Street Railways

In the recent case of The Newport News and Old Point Railway and Electric Company, the Supreme Court of Appeals of Virginia held that after a street railray had secured a franchise for laying its rails on a certain street and had gone ahead with the work, if it ran its cars for the benefit of the public, then there is much reason for affirming that it had the paramount and exclusive right to that part of the street occupied. If, however, it secured the franchise and laid its tracks for the sole reason of keeping another company from doing so, the cause ought not to be regarded as sufficient to vest a right under a general ordinance. It was also held that a waiver of forfeiture of a company's franchise by the state or municipality does not confer any new right on the company, and that no competitor can take advantage of it in anyway. The public can receive a benefit from it only by its being enforced at the election of the state.

Improvements in McKeesport

During the last fiscal year, ending April 1, 1904, the city and taxpayers of McKeesport, Pa., expended over one hundred thousand dollars in the improvement and paving of a number of thoroughfares, and also in the construction of sewers. The amount of money expended from April 1, 1903, to April 1, 1904, was, according to the report of the city controller, $105,582.75. With this amount of money 22 new sewers were constructed and 16 streets improved.

Since McKeesport became a city of the third class in 1891, $492,318.57 has been expended for the improvement of streets and the construction of sewers and other municipal improvements. Of this amount the city has improvement bonds outstanding amounting to $198,143.95. Fifty thousand dollars' worth of bonds will shortly be issued for the cost of the underground fire and police system, the new garbage furnace and the construction of new water mains, which will increase the indebtedness of the city considerably.

Free Public Baths for St. Louis

St. Louis will soon have free public bath houses. This is a result of the persistent work of the Civic Improvement League. Building Commissioner, George U. Heimburger, has done active work in the preparation of plans for remodeling a part of the Old Soulard Market Building in South St. Louis. The Free Bath Commission, which Mayor Wells appointed, has been making an extended investigation as to the most desirable location for baths, and one of the sites selected is the old market house, which has been abandoned for business use. Rough plans were prepared by the Commission, showing how this building could be remodeled, and these were turned over to the Building Commissioner, who is now working on the plans and specifications. These will be turned over to the Board of Public Improvements and contract for remodeling will soon be let.

Pollution of Iowa Streams

The Sioux City, Ia., *Tribune* recently pointed out that if the State Board of Health carries its campaign against the pollution of Iowa streams and rivers, nearly every city and town in the state will be compelled to revise its method of caring for its sewage. Among other things the resolution designed to bring about the reform provides that:

"No starch factory, creamery, paper mill, glucose factory or other factory or mill from which waste products are discharged, which pollute the lakes, streams or watercourses of the state, shall be established or maintained until such location where it is desired to establish such factory shall have been duly examined by the engineer of this board and permission granted for the establishment of such factory or mill.

"No factory creamery or mill shall be permitted to discharge its waste products or sewage into lakes, streams or watercourses of the state where such pollution becomes a nuisance, offensive and a menace to the public health.

"This board, through its engineer, shall determine whether such discharge or pollution of the lakes, streams or watercourses of the state is detrimental to the public health."

Model Brick Pavement in Chicago

The progressive citizens of Chicago are setting an example which other American cities will do well to imitate. They have been investigating the paving question as a whole with the purpose of greatly improving the thoroughfares of the city. Among other plans approved for the betterment of the street conditions of that city is the construction of a "model brick pavement." Justly and wisely the Board of Local Improvements has gone to the proper source for the model brick pavement; viz., the people who manufacture paving brick. Any other course would be unjust to that branch of the paving industry. The city authorities were fortunate in getting Mr. D. V. Purington, President of the Purington Paving Brick Company, to lay this strip of model brick pavement, because he has had many years' experience in the manufacture of paving brick and the requisite knowledge of how to lay it.

The thoroughfare turned over to Mr. Purington for the purpose of demonstrating to the people of Chicago the practicability of a properly laid brick pavement is the east half of Lasalle street, from Washington to Madison streets. In front of the Chamber of Commerce, this is easily one of the busiest thoroughfares in Chicago. It is exposed to hard traffic six days out of the week. The brick pavement which Mr. Purington took up had been down ten years, during which period it had been torn up just eighty-four times for repairs. Mr. Purington says he fully expects the new pavement to be just as good in ten years as it is to-day. The result will certainly be awaited with considerable interest, both on the part of brick manufacturers and paving contractors, as well as all citizens who have the welfare of their town's pavements at heart.

Mr. Purington is correct in his assertion that the very best brick made will make a very poor pavement unless it is properly laid. It was for the purpose of demonstrating that brick properly laid will make an ideal pavement that Mr. Purington obtained permission to use a section of busy Lasalle street to to carry out his ideas. With this object in view his first care was to send to Terre Haute, Ind., for Mr. George R. Grimes, civil engineer of that city, and enlist the latter's services in the Chicago demonstration. Mr. Grimes is the man who supervised the construction of Terre Haute's many brick pavements, which are regarded as the finest of their kind in the world. Under Mr. Grimes' supervision, Mr. Purington's sample street was completed September 3d.

In constructing this model pavement Mr. Grimes has observed his own methods of dealing with the seven vital principals of brick street laying, as follows:

I, Sub-foundation, commonly called grading; 2, curb setting; 3, intermediate foundation of concrete; 4, rolling of brick sand cushion; 5, laying and rolling of brick; 6, provision for expansion and contracting; 7, filler.

The only departure made from Mr. Grimes' regular rules governing the laying of brick pavements was in the foundation. It was only intended to use a six-inch foundation, but as the gas company had just dug up and replaced this street for the purpose of calking mains, it was thought wise to put in an eight-inch foundation. Great care was used in rolling the brick. The work was done entirely by hand. A cement grout was used in filling. After the pavement was in, brick were taken up in two or three spots. It was seen that each brick had become imbedded in the sand cushion, the sand oozing up between each joint, to be met squarely by the grout filler, thus firmly cementing the pavement together and bidding fair to confirm Mr. Purington's fond expectations of the street.

Rubber Paving in London

The following particulars regarding the rubber paving of the two roads under the hotel at Euston station may be of interest:

This paving was laid down in 1881 by Kirk & Randall, the contractors for the extension of the hotel. Its cost per square yard was as follows:

Concrete foundation work	$5.60
Rubber paving, supplied by Messrs. Macintosh & Co.	27.10
Total approximate cost	32.70

When the rubber was laid down in 1881 it was 2 inches in thickness. In May, 1902, after twenty-one years' wear, the portion on the incoming road into the station was taken up and carefully examined, when it was found to have worn down to about five-eighths of an inch in the thinnest place, namely, at the incoming end, where horses first step onto it from the macadamized road. Other parts of the rubber were worn down to 1 inch and 1¼ inches, these places in each case being near the center of the roadway. Renewal was therefore considered necessary.

In recent years the price of india rubber has largely increased, and its quality varies. Tenders were invited in August, 1902, from four firms, and the prices received varied from $27.09 to $86.22 per square yard, Messrs. Macintosh & Co.'s price being $49.26. The lowest price was accepted, namely, the tender from the India Rubber, Gutta-Percha and Telegraph Works Co., of $27.09 per square yard. The material to be used is not, however, supposed to be pure india rubber, but appears suitable for the purpose, and is vulcanized. Rubber of a similar quality was laid in the year 1895 in Wellington Court, 42, Albert Gate, Knightsbridge, London, and it was ascertained that "it had worn most excellently and given every satisfaction" at that place.

The total cost of the renewal in 1902 of the paving on the incoming road was $28.75 per square yard, including laying, after credit had been given for the old rubber taken up. Since the paving was laid down in 1881 the average cost of general maintenance and examination has been slightly under 6½ cents per square yard per annum.

At the recent addition to the Savoy Hotel, London, the courtyard was paved with rubber. The contractors, Messrs. James Stewart & Co., courteously supplied the following particulars concerning this pavement:

"The amount of rubber used in the Savoy courtyard is 2,195 square feet, 2 inches thick, and the weight of the rubber is 15¼ pounds a square foot. It is laid on a concrete foundation, finished with cement floating to make it smooth.

"The cost of this material laid is $4.54 per square foot, and it may be added that the cost for the same quality of material varies in direct proportion to the thickness.

"We have had no actual experience with this rubber paving for any length of time, but we investigated it pretty thoroughly at the time it was decided to lay it here, and found that the small piece at the entrance to the station at Euston was laid some twenty years ago. The traffic there has been very heavy.

"We think there is no doubt that the results of rubber paving will be entirely satisfactory, but the cost will undoubtedly make the adoption of it for general use prohibitive."

The court measures 75 feet by 50, and the cost of paving was $9,733.

♠

The Late "Golden Rule" Mayor Jones

WRITING in the *World's Work* for September, Brand Whitlock writes sympathetically of the dead mayor: * * *

In his factory, in Toledo, he had posted this:

"RULES FOR THE SHOP."

"Therefore, whatsoever things ye would that men should do to you, do ye even so to them."

That was all. It was difficult to understand; it seemed that Jones was unsophisticated enough to take the thing seriously. Still, he was popular among the workingmen, and, even if, in the campaign that followed, he was dubbed "Golden Rule Jones," and even if the politicians were made to feel rather self-conscious and silly about him, they supported him, and he was elected by a small plurality, Jones took the Golden Rule into politics with him, although the politicians complained that he would not apply it in their usually desperate case, for he would not do the things they wished him to do.

He had gone to the public schools for about thirty weeks, in childhood, and that is all. And yet he knew mechanics, sociology, literature, music, the philosophy of history—and knew them well. More than all, he knew human nature, as few know it. Men seemed to stand naked before him, stripped of all degrees, distinctions or honors. He never truckled or coddled; the robes of office never added anything to a man in Jones' eyes. Judges, mayors, presidents, kings, were all men to him, and nothing more. He could talk and joke with workingmen without that fear of being misunderstood or resented that would assail the ordinary politician, and make him condescending—it never occurred to Jones that he was any better than they or any different from them.

The charity he was able to dole out gave him no comfort—he doubted always his right to money that came to him in the form of profits. He gave and gave. He devised all sorts of expedients for sharing profits with the men, who, he said, made them for him. He lived like an anchorite himself. I tell these things, because they seem to me to represent a remarkable culture—such a culture as Matthew Arnold must have meant, for Jones made life "a study of perfection." He revealed his spirit best, perhaps, in the beautiful "Letters of Love and Labor," which he wrote to his men in his shop, putting them, each week, in their pay-envelopes, letters, which, because of their charity, their artless simplicity, will some day rank high in the literature that is being evolved out of a slowly awakening social conscience.

Material Progress in Early New York

MR. THOMAS A. JANVIER, in his book, "The Dutch Founding of New York," makes as a final point the enormous gain in material prosperity in favor of that shifting of ownership which changed New Amsterdam into New York. When the English took over the city (September 8, 1664) the number of houses in it—as shown by Cortelyou's survey of the year 1660—was about 350, and the population was about 1,500 souls. An authoritative record has been preserved of exactly what the city gained in its first thirty years of English rule. In the year 1678, the total number of houses in New York was 384; the total number of beef cattle slaughtered was 400; the total number of sailing craft was 18; and the total revenues of the city were less than £2,000. In the year 1694, the number of houses had increased to 983; the number of beef cattle slaughtered to 4,000; the number of sailing craft to 125; and the city's revenues to £5,000.

♠

Parks and Boulevards of Portland

THE annual report of the Park Board of Portland, Oregon, in that volume in which it is set forth, contains an elaborate and beautiful photographic panorama of the city of Portland. The estimated resources of the Park Department for the year 1904, including available balance, receipts from taxes and receipts from miscellaneous sources, is $31,130.48. The estimated expenditures for 1904 is: Labor, $15,240; materials or supplies, $2,825; miscellaneous, $13,000.

The provision of the new charter of Portland came into effect January, 1903. The Park Board, by appointment of the Mayor, consists of four members. The principal subjects calling for the attention of the Board were monuments, park music, landscape architect, new parks, improvements and suggestions. The Park Board appropriated $1,000 toward a music fund which was generously supplemented by private subscriptions. A park orchestra was organized and uniformed and 35 concerts were given in the months July-October. A permanent band-stand has been erected.

Mr. John M. Olmsted, the landscape architect, spent a month on the Pacific Coast in consultation with the various boards, giving advice as to the laying out of grounds and parks He made a tour of the Portland parks and carefully inspected the surrounding territory of the city. Mr. Olmsted made a formal report on the situation. The Park Board has been laboring to improve the general condition of the parks in view of the proposed exposition of 1905.

♠

Regulation of Electric Wires

AN ordinance was recently passed by the city council of Montgomery, Ala., without the approving signature of the Mayor, regulating the stringing of electric light, heat and power wires, and the placing of electric appliances on electric light poles. The ordinance is as follows:

"Section 1. That all wires and appliances for electric light, heat or power service placed on or strung from any electric light pole in the city of Montgomery shall be located on said poles as follows:

"(1) All such wires of high potential shall be strung as near the top of pole as practicable, and all such wires of

low potential shall be strung beneath all such wires of high potential, and as far down on poles as practicable; and on poles used jointly by two or more companies having such wires, there shall be, wherever it is practicable, a distance of not less than thirty-six inches between the wires of each company; provided, that taps or lead wires from the high potential wires may be carried into and through the space allotted for other wires to the transformers with which they are to be connected.

"(2) The taps or lead wires from high potential wires to transformers must be securely fixed to each cross arm which they pass, in such a manner as to prevent their coming in contact with other wires; and such taps or lead wires must have an additional covering of circular loom or of some other insulating material affording equal protection.

"(3) All transformers used in connection with said electric light, heat or power wires shall be placed on poles near the low potential wires.

"(4) The distance between the wires next to but on opposite sides of each pole shall be not less than thirty-six inches.

"(5) All cross arms placed on poles by any electric light, heat or power company within the fire limits of the city of Montgomery shall have not less than six pins, and such cross arms shall be used to their full capacity before owners of same shall be permitted to place additional cross arms for wires of the same potential on such pole or poles.

"Sec. 2. The placing and stringing the wires and appliances for electric light, heat and power service, as provided for by the first section of this ordinance, shall be under the supervision and direction of the city electrician."

Facts About the Parks of St. Paul

The present limits of the parks and parkways of St. Paul embrace 721 acres of land in parks, 351 acres of water in parks, 117 acres of land in parkways, making a total of acres in parks and parkways of about 1189. This exceeds the land areas of parks in Minneapolis by 106 per cent. It is not likely that there will be any considerable enlargement of the park areas of St. Paul for years to come. But if the hopes of the Board are realized the next few years will witness a large extension of the boulevard and parkway system. Its completion, as planned, will add about twenty-seven miles to the five and one-half miles now comprised in the boulevard and parkways of St. Paul and over 450 acres to their area.

The total amount expended in the purchase of land for park purposes, almost wholly from the proceeds of bonds and other city obligations, up to the present time is $225,781.16. This is aside from the moneys raised by assessment to pay the awards for land condemned, which amounts to $104,831.01. Total expended for acquiring land, $330,612.17. During the same time there has been expended by the City Council, previous to 1887, for the improvement and maintenance of parks and parkways, for improvements, $75,000; for maintenance, $10,806.50. The Park Board has expended, from 1887 to 1903, for improvements, $416,926.49; for maintenance and administration, $327,559.36, making a total expended for improvements and maintenance of $830,292.35, making an average of $51,893 a year for improvements and maintenance in the sixteen years.

The Park Commissioners of St. Paul have for years stimulated public interest in the proper improvement and ornamentation of its residence streets. To this end they sought the co-operation of the Civic League. First, to obtain the general concurrence of property owners in the plan of widening the street lawns and narrowing the roadways. Second, to secure the passage of laws empowering the Board to plant and maintain trees and cut the grass on street lawns. Under these laws the cost of tree planting is not to exceed 12½ cents per linear foot, or of cutting grass, 2 cents a linear foot, and is assessed on the abutting property. As a result, the grass on about two and one-fourth miles on street lawn is now being kept in trim condition by the park lawn mowers, at a cost of little over $2,500 a year. The whole number of trees planted by the Park Board since the law was enacted in 1899 is 500.

The Street Paving of Newark

MR. J. CROWELL MUNDY, General Superintendent of Works at Newark, N. J., states in his last report that more work in cleaning and repairing streets has been done during the year than in previous years; with an increased appropriation of $135,000, economy has been practiced, leaving a balance on hand of $317.30. The increase in the mileage of paved streets during the year was 9.90 miles, making a total to date of 147.56 miles, divided as follows: Asphalt, 51.10 miles; brick, 9.78 miles; granite and trap rock, 59.52 miles; cobble, 10.44 miles; Telford, 16.09 miles; bitulithic, 0.63 miles.

During the year 1903 repairs have been made to forty-seven of the sixty-three streets paved with asphalt, where the guarantee of the contractors to keep them in repair has expired. By collecting the old asphalt when making openings in asphalt streets, the Superintendent was able to make the necessary repairs without using but little new asphalt, of which he has quite a quantity on hand.

The Engineer of the Department of Streets and Highways, Mr. Ernest Adam, has presented a table showing the amount and cost of street paving done in Newark by order of the Board since its organization in 1891. The city has 50.455 miles of asphalt, cost, $2,379,294.99; 37.855 miles of granite, cost, $1,752,168.70; 9.785 miles of brick, cost, $467,852.91; 8.490 miles of trap-rock, cost, $345,712.26; 4.735 miles of Telford, cost, $102,423.45; 0.720 miles of cobble, cost $16,843.14, and 0.630 miles of bitulithic, cost, $33,833.86. The net increase in the pavements from 1891 to 1904 was 96.52 miles.

All asphalt pavements which were laid under a five-year guarantee only, is now in charge of the city, amounting to 423,213 square yards; that which was laid under a ten-year guarantee amounts to 611,193 square yards. The limitation of guarantee and the amounts to be paid the contractor per square yard per year during the second period of years are as follows: 152,147 sq. yds., expiration 1008. price per yd., 5 cents; 11,639 sq. yds., 1909, 5 cents; 14,555 sq. yds., 1910, 5 cents; 250,664 sq. yds., 1910, 2½ cents; 111,409 sq. yds., 1911, 2½ cents; 69,138 sq. yds., 1912, 2½ cents; 1,432 sq. yds., 1913, 2½ cents.

Economicol Maintenance of Streets

An example of New England thrift is shown in the way in which the small city of Ansonia, Conn., builds and maintains its roads.

On the city farm there were several stone wall fences. These walls were taken down and hauled to a central point where the city stone-crusher was located. Early in April, last year, the stones were broken up and 113,435 square feet, besides 200 tons, of broken stone were placed on the streets. In this economical way Ansonia helped solve the good street question. About $5000 were spent on the streets and the cost of running the stone crusher was $407.62. The Board of Public Works requested an appropriation of $13,000, to be used by the Street Department this year.

It is interesting to know in this connection that at the last census the population of Ansonia was 12,681 and the assessed valuation of property was $8,253,383, which places Ansonia thirteen in the list of Connecticut cities. The city owns the sewers and fire alarms, but has no paid fire department. The service is volunteer. No fire engines are used as the pressure on the water mains is such that they are not needed. Ansonia has partially overcome the overhead wire nuisance by having the telephone wires placed underground.

Taxes on Fire Hydrants Not Collectible

The Court of Appeals of Maryland has decided a case of the Commissioners of Cambridge versus The Cambridge Water Company, in which it appears that the town of Cambridge had passed an ordinance that all persons using or maintaining fire hydrants, telegraph poles and other fixtures on any of the streets or alleys in the town, are required to file annually a list of all such fixtures, with the town clerk or treasurer and to pay him, during the month of December, a fee of $2.00 for each fixture used. If this ordinance is not complied with, a penalty is imposed upon all owners of such fixtures failing to do so. As the water company failed to pay this fee on the fire hydrants, the commissioners of the town sued it; but the water company secured a judgment in court and this was affirmed by the Court of Appeals. The Court of Appeals of Maryland held that the power to impose license taxes or fees upon persons or corporations engaged in the pursuit of a particular occupation is not inherent in municipal corporations and will never be held to exist unless it has been conferred on a municipality by the state, either in express terms or by necessary implication. The charter of the town enumerates the classes of persons or corporations from whom license fees may be collected, and as water companies and fire hydrants are not mentioned therein, the court held that the license fees were not lawfully imposed and therefore not collectible.

Preventing the Spread of Consumption

The following "measures for preventing the spread of consumption" are again brought to public attention by the city authorities of Frankfort, Germany:

"Consumption of the lungs and throat (tuberculosis) is transmitted to healthy persons from the expectorated matter of consumptives and others when the expectorated matter, after it has dried and become reduced to dust, is breathed in by healthy persons. The feces of diseased persons can exert an injurious influence in like manner.

"By making all such excretions and excrements harmless the spread of consumption can be restricted and healthy persons can be protected.

"In order to prevent the drying and reduction to dust of such matter, every consumptive and every person who coughs (often persons who cough do not know that they are ejecting bacilli of tuberculosis) should take care that it is received in spittoons or cuspidors, or in similar vessels containing a little water, or, still better, chloride of lime or salt water. The use of such liquids is advisable, because they prevent freezing, and also the drinking of the water by domestic animals. No cougher should spit upon the floor or ground or in a handkerchief.

"For receiving such matter, cuspidors should be kept in the rooms of persons who cough and on the landings of staircases in all apartment houses, and especially in buildings and rooms of a public character (railway stations, hotels, restaurants, halls, theaters, schools, etc.).

"These cuspidors should be 2 inches high and 8 to 10 inches in diameter. They should have smooth, slightly curved edges, and should be made of smooth glass, porcelain, china, or enameled iron. They should contain water to a depth of about four-fifths of an inch. In places of public concourse a card should be attached to the wall bearing, in distinctly legible letters, the word 'Cuspidor.'

"These vessels should be supplied in sufficient numbers. As the water evaporates, more should be added. In order to prevent the accidental spilling of part of the contents, or the overturning of the cuspidors, they should be suitably fastened or they should have a form which obviates the danger. The cuspidors should be carefully emptied in water-closets, and they should be daily cleansed with boiling water.

"General cleanliness is the first condition for the successful protection of the public health. Consumptives should give especial attention to cleanliness. The sitting rooms and bedrooms of consumptives should have only such curtains, bed coverings, and the like as can be easily washed. There should be no carpets on the floors and none on the staircases leading to such rooms. Upholstered furniture should be used as little as posible and should always be covered with wash stuffs. Iron garden furniture with springs is the best substitute for upholstered furniture. It facilitates the cleaning and disinfection of the rooms and their contents. Mats which are to be laid in front of beds should be washable.

"The entire floors of such rooms should be washed daily for the purpose of removing dust, and even in winter the rooms should be properly aired daily for at least one hour. Once a week the rooms should be thoroughly cleaned, and they should be properly disinfected every third month.

"Uncooked milk may also become a transmitter of consumption. The public is accordingly warned against its use.

"Compliance with these rules, especially with those regulating the disposition to be made of dangerous matter, will remove an element of danger in the intercourse of healthy persons with consumptives and restrict the transmission of this most widespread of all diseases.

"May every one do his utmost to assist in this movement against a common danger."

Nature Decorations for Cities

THE report of the (New York) Committee on Flowers, Vines and Area Planting states that its object is to promote the adornment of this City with nature decorations by the use of trees, shrubs, vines and window boxes. In other words, it is the logical extension of the system of parks and boulevards applied to such places and streets where it is impossible or impractical to relieve the monotony of City architecture by the further extension of natural effects.

It is assumed as a working basis that a modern city should resemble, so far as is possible, "a city within a park," rather than a few parks and boulevards scattered here and there within a crowded and densely constructed city of brick and stone. Or, to put the proposition in a work-a-day form, it is assumed that those who make it their business to beautify a modern and unscientifically constructed city have for their motto, "wherever a part cannot be placed, construct a boulevard." Hence, the motton of this committee is "wherever a boulevard cannot be constructed, plant vines, trees, shrubs and encourage the use of the flower-box." Thus, if the Committees on Parks and Throughfares, and this Committee successfully co-operate in their work, the time will come when a city vista will always be terminated by a park, lined by a boulevard, or by a tree-shaded and vine-clad street.

The Committee concludes that if the Municipal Art Society can succeed in inducing New York to secure a municipal nursery, it will confer upon New York one of the greatest and most essential blessings required by all densely populated cities.

♣

Glasgow's Extensive Estates

The Cleansing Committee of Glasgow Corporation (Scotland) can furnish a splendid object lesson to the anti-municipal ownership advocates.

The total area of this committee's estates is 1,701 acres, of which 1,509 acres are the property of the Corporation and 192 acres are held on lease. There are municipal farms, municipal quarries, municipal brickworks and a prospective municipal coal mine.

It is worth while to inquire how the Committee became possessed of all this property, for it was by no means with the intention of flouncing municipal enterprise before the eyes of the world that it was acquired. It has grown out of an earnest endeavor to preserve the health of the city. The object the Cleansing Committee had in view in purchasing the estates was to provide a ready and easy outlet for city refuse which could not be disposed of otherwise; another aim was to provide better feeding for the stud of horses used in the cleansing and other departments of the municipal service.

The Cleansing Committee has realized over and over again how important and necessary these estates have been in connection with the working of the department. Before they were acquired by the committee there was no alternative (during certain seasons when farmers could not take delivery of manure) but to lay the refuse in depots all round the outskirts of the city. Especially during the summer months was this practice accentuated. The result was that a gigantic menace to the health of the citizens was created. Steps had to be taken to remedy matters, so numerous were the complaints made with regard to the nuisance. Cremating furnaces were introduced and gradually extended, until now there are six destructor stations with 58 cells, which are capable of destroying over 50 tons of refuse daily.

These furnaces, however, were not sufficient to deal with the enormous and evergrowing quantity of refuse produced in the city. Hence the necessity arose for purchasing land in the country, whither the surplus material could be sent. The committee started operations with a small farm, which was leased in 1879 for 31 years, but after that it was decided to buy land outright.

So step by step the committee has acquired various estates, until now it is a landowner on a very large scale. Besides giving the Cleansing Committee facilities for the tipping of refuse and the growing of crops, the Health Department has taken a portion of ground for the erection of a small-pox hospital, while accommodation has also been provided by the Sewage Committee to tip sludge. A revenue running into many hundreds of pounds is derived from quarries and brickworks on the estate. The committee has been getting expert advice as to the mineral resources of one of the estates, and although satisfied that coal to the extent of 8,000,000 tons is in the property, it is advised to defer working meantime, and seeing that at one point it is within 40 ft. of the city boundary, the minerals will doubtless be all the more valuable to the Corporation.

♣

Government Railways of Natal

THE successful administration of government-owned railways is well exemplified in the railways of Natal, South Africa. It is only a few months since the Colony of Natal emerged from the *sturm und drang* of the war in South Africa, but, judging from the progress indicated by the Report of the General Manager of the Natal Government Railways for the year ended 31st December, 1903, rapid strides have been taken towards a renewed era of prosperity. To a considerable extent, of course, the Natal Railway system, as one of the main coast routes for Transvaal traffic, must be dependent upon the prosperity of the sister Colony, and the considerable traffic which has flowed into the Transvaal to stop the breaches caused by the losses and destruction of war have been contributory factors to the excellent results which the railways show. The total revenue for the year 1903 amounted (roundly) to $12,805.00 as compared with $10,230,000 in the year 1902, an increase of no less than 25.19 per cent., despite the fact that a reduction took place in goods and passenger rates, which on the old basis represented $500,000 per annum. On the payment side of the account, working expenditure amounted to $8,955,000, in its turn showing an increase of 24 per cent. on the previous year, but including more than $1,250,000 expended upon additions and improvements to buildings ways and works, in order to cope more efficiently with traffic developments; and in this direction the Natal Railway management have afforded a striking illustration of what progressive administration can achieve.

INCIDENTAL ITEMS OF INTEREST

Many Matters of Moment to Municipalities Briefly Told—Short Record of Happenings and Facts in City, Town and Village

* * * The Board of Health of New York has passed an ordinance prohibiting the sale at retail of carbolic acid stronger than a 5 per cent. solution, unless the purchaser presents a physician's prescription. Many cases of suicide by carbolic acid made the ordinance necessary.

* * * The Joliet, Ill., *News* recently tabulated four grade crossing accidents in one day, three of them fatal.

* * * The gas company of Sheboygan, Wis., recently offered to open a school for objecting consumers to teach the working of meters and to prove that only the company can be cheated when meters are out of order.

* * * Mayor Ganlin and city officials of Woonsocket, R. I., are investigating the rights of the city as against the street railway in connection with the damage done to lead water pipes through electrolysis. The city may sue for damages.

* * * The city officials of Memphis, Tenn., strenuously enforced the ordinance compelling telephone and telegraph companies to place the wires under ground. Mayor Williams ordered that the managers be re-arrested every day until they complied with the law.

* * * It was recently ordained by the city council of Montgomery, Ala., that it shall be unlawful for any person to run, operate or drive any automobile, locomobile or motor vehicle of like kind on any of the public streets or highways of the city of Montgomery at a higher rate of speed than eight miles per hour. Penalty; fine of $1 to $100 or hard labor for six months on the streets, or both.

* * * Alderman Stockmar, of Birmingham, Ala., introduced a resolution that the ordinance regulating the sale of cocaine and other dangerous drugs be enforced.

* * * Three members of the Woman's Club League recently petitioned the Board of Works of Ft. Wayne, Ind., for permission to clean pavements and alleys in one down town block for three months, just to show the board how the work ought to be done. The league proposes to pay all the expenses of the work. The board took no action.

* * * August 25 was clearing up day in the village of Oceanic, N. J. Some members of the Improvement Society arrived with teams, others came with mowing machines and still others came with scythes, shovels, rakes and hoes. This army started out to make an onslaught on the unsightly spots in the village. A distribution was made of the work and each person was given his particular task. Work was begun at one end of the village, and a clean sweep was made. Wherever there was a vacant lot grown with rank weeds the scythe and the rake was applied and the lot put in apple pie order. On some lots the mowing machines were used.

* * * There is every probability that the important question of whether the city of Rochester, N. Y., or the Rochester Railway Company shall pay for the paving between the rails of the tracks, and two feet outside the rails of the company's road in St. Paul street and Park avenue, will be passed upon by the Appellate Division at the next term of the court. The final papers in the appeal have been filed.

* * * The new Police Board of New Orleans, La., has ruled that if any witness appearing before the Board shall testify falsely, that such should constitute perjury and be punishable as would perjury committed before any competent court.

* * * An investigation conducted at Lorain, O., demonstrated the fact that an electric cable under the river there recently put in place is practically destroyed through the action of electrolysis, due to leaks from the Lake Shore Electric Railway. The city has for a month been conducting an investigation, the discovery having been made that the water mains throughout the city are charged with electricity. The expert electrician hired by the board of public service, said that he would be willing to say that were a wire attached to a water main on any of the main streets and carried into a house, it would furnish light for the family.

* * * The remarkable number of 10,000 people gathered in Galveston, Tex., on August 22, to witness the ceremony of dedicating the new sea wall. The structure is said by the Texas papers to be one of the wonders of modern times. The cost of the great wall was about $1,500,000.

* * * The Hoosac Valley Street Railway Company will bring suit against the town of Williamstown, Mass., alleging that the latter unlawfully quarantined North Adams and kept North Adams people out of the town because of the smallpox epidemic. The company claims its business was damaged several thousand dollars.

* * * A public playground exclusively for girls is about to be opened in New York City. This is said to be the first of its kind in any city.

* * * A motor-car paper suggests an application of chemical salts to roads as a means of laying the dust. "Calcium chloride is practically," the writer says, "a waste by-product of several manufacturing processes. It is highly deliquescent and soluble in water. Strong solutions of this applied to the roads would keep them almost permanently damp." It would be cheaper than oils and would be without their objectionable odor, and, being a neutral salt, would be harmless to motor-car tires."

* * * At Rosemont, Mass., four acres of land, including a stone ledge, was purchased by the city, together with a right of way twenty feet wide, and a large part of the stone used for road building during the year, has been taken from this ledge. The total output of the ledge was 8,300 tons of crushed stone and 200 tons of small uncrushed stone. The price paid by the city for the ledge was $1,000, for land and right of way, the city to grade the right of way before January 1, 1906. At another city ledge the total output was found in the same manner to be 2,700 tons of crushed stone, and 900 tons of uncrushed stone.

WHAT POLICE AND FIREMEN ARE DOING

St. Louis Police and Fire Departments—Fire Protection at the World's Fair—The Chattanooga Convention

St. Louis Police Department

CHIEF KIELY, St. Louis Police Department

THE year 1903 was one of extraordinary activity in the St. Louis police department. There was not one month in the twelve that did not bring with it a serious labor strike, making great demands on the department. A large percentage of the men were kept on "detached duty," being stationed at various points in anticipation of violent outbreaks. The succession of labor demonstrations reached its climax in the hack and cab drivers' strike, declared in January, 1904. During its currency the police made forty-six arrests. The Citizen's Industrial Association of St. Louis tendered a unanimous vote of thanks to the Governor, the Police Commissioners, to Matthew Kiely, the Chief of Police, and the police force of the city for the skillful and determined handling of the strike. Five hundred new policemen—known as emergency special policemen—were selected to increase the present force, with a view to handling the crowds visiting the fair.

The past year witnessed the establishment of a Juvenile Court, which had been earnestly advocated by the Chief of Police. Chief Kiely protests against the use of the police stations as sleeping quarters for the indigent poor. He recommends the segregation of the prostitutes where they will be subject to police and medical surveillance.

The amount of money expended for the department during the year was: Salaries, $1,378,634.24; for superintendent police stables and other employees, $92,972.40; for horses, $8,495.00; forage, secret service and supplies, $83,317.36; repairs, purchase of lots and erection of buildings, $14,979.51.

St. Louis Fire Department

CHIEF SWINGLEY, St. Louis Fire Department.

THE Fire Department was established in 1832, ten years after St. Louis became a city. At that time it had a population of about 6,500 people, and its only protection was a bucket brigade. The City Council early that year delegated Martin Thomas, a leading citizen, to go East and procure fire engines He purchased three suction hand engines, a small double-deck machine of John Agnew, of Philadelphia, another suction engine named "Pat Lyon," in honor of Philadelphia's famous blacksmith and fire engine builder, and one of the old rotary pump engines, manufactured in New England, known as the "Coffee Mill." A duplicate "Coffee Mill" engine is now on exhibition at the World's Fair, which is said to have been once owned by the company of Alexandria, Va., of which Washington was at one time a member. In 1850 the City Council granted $1,000 per annum to each company with disastrous results. A bad element took the place of good men, and the volunteer department quickly lost its former excellent reputation. Fights and disturbances became common and gradually the companies ceased to exist. The last to go was the first that was organized, Central No. 1, in 1858.

The first volunteer company to retire was Union No. 2, in 1855. It sold its property and purchased of Abel Shawk, of Cincinnati, O., a steam fire engine, which arrrived at St. Louis December 26, 1855, crossing the Mississippi on the ice, and presented it to the city. That was the first steam fire engine west of the Mississippi River, and St. Louis was the sixth city to have one in service, Cincinnati in 1853, Boston, Philadelphia, New Orleans and Columbus, O., in 1855, preceding it by a few months only.

In 1857 the Department was changed from a volunteer to a paid force, and H. Clay Sexton was its first chief, serving until 1862, when he was retired on account of the Civil War. In 1869 he again became Chief, and was succeeded by John Lindsay, April 19, 1885, who in turn was succeeded by Charles E. Swingly, the present incumbent, May 15, 1895. The Department, which is fully paid now, consists of 41 engines, 14 trucks and two water tower companies, a total of 610 men. Last year there were 2,565 alarms, with a total loss of $1,200,649.

St. Louis was the third city to possess an electric fire alarm telegraph system installed in 1858. Boston was the first city to have such a system, and the first alarm of fire by electricity was given by that system at 8.25 o'clock P. M., April 29, 1852. Philadelphia possessed the second system, first used May 1, 1856.

The St. Louis Salvage Corps, of which J. O. Glanville is superintendent, went into service July 3, 1874, in command of Charles Evans, who was its superintendent continuously until his death, in June, 1903. The Corps now consists of three companies.

St. Louis' greatest fire occurred May 17, 1840, destroying 430 buildings, 25 steam and 9 other river boats, with a total loss of $2,750,000 and two lives.

The city at that time had a population of about 45,000 people, had an occupied river frontage of about three miles, and was largely engaged in river commerce. The year 1849 was one of affliction for the rapidly growing city. From February to October Asiatic cholera raged, carrying off thousands. In May occurred this great conflagration, and in June the river was so high that it flooded the adjoining sections and for a time stopped all river traffic and commerce

The fire paralyzed the city for a time, but was a blessing in the end It swept the old French portion of the city, with narrow streets and ancient buildings. Within five years it was reconstructed with modern business structures.

World's Fair Fire Protection

The World's Fair property is protected from fire by five companies, two double and three single, each company composed of ten men, of the St. Louis Fire Department, under the command of Chief C. E. Swingely and under the immediate charge of Assistant Chief Alexander P. Chrestie. There are five fire stations on the grounds. All the stations contain the most modern appliances and instruments.

There are 240 signal stations on the grounds connected with the fire alarm system, many of them being located inside the buildings at frequent points. Over each signal box is a red light at night to indicate its location.

There is a high-pressure water system on the grounds, similar to that in use in Philadelphia, a battery of fourteen Worthington fire pumps, with a capacity of 14,000 gallons per minute, giving a pressure of 150 pounds at all times. There are at least 500 hydrants located on the grounds, exterior and interior. The fire alarm system was installed January 1 of this year, and since then there has been about forty alarms. Only two fires were of any size. On the morning of June 24 the Hoo Hoo buildings, belonging to the Lumbermen of America, was damaged to the extent of about $15,000, and a restaurant in the city of Jerusalem July 5, which was damaged to the extent of about $5,000.

Fire Fighting at Masillon

Fire Chief Andrew H. Burke, of Masillon, O., has submitted to the Board of Public Safety his annual report for the year ending December 31, 1903. Accompanying this report is a complete record of the Department with amount of expenditures, insurance and losses, and all items of interest connected with the department, also suggestions from the Chief.

The department has answered during the year forty-four alarms.

The fire losses for the year were as follows: Total loss, $9,386.02; total insurance, $8,077.02; net loss, $1,309.

There are at present three fire stations in the city, equipped as follows: No. 1, or central fire station, corner of Factory and Charles streets, has one combination chemical and hose wagon, one hook and ladder truck, one police patrol, one chief's wagon, 2,650 feet of good hose and seven horses. In the past year there has been added one watch station, one patrol wagon, which is being run in connection with the Department. The patrol wagon was installed November 10. The number of calls for November was 22, prisoners handled, 33. In December there were 31 calls and 33 prisoners were handled.

At station No. 2, corner of Center and Plum streets, there are one horse carriage, 500 feet good hose and 100 feet second-class hose.

At station No. 4, on Fay street, there are one hose carriage, 500 feet of good hose and 100 feet of second-class hose.

The manual force of the Department at present consists of six permanent men and one extra night man, and forty-nine call members.

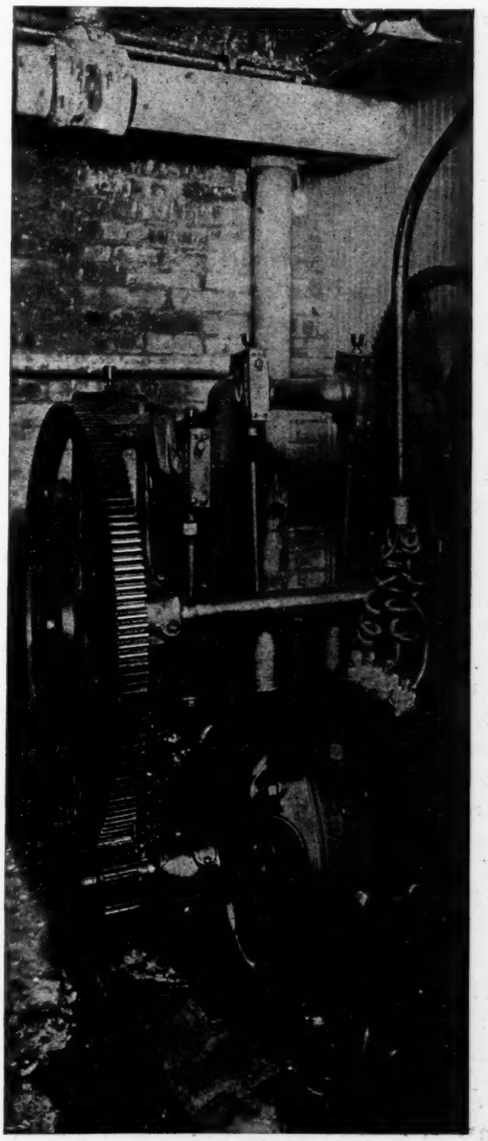
The fire alarm system has given excellent service during the year. The water pressure has been good at all times.

Accompanying this report is a tabulated report of the minute men service.

The Chief made an annual inspection of all shops, factories and public buildings and generally found them in good condition. Upon an inspection of the churches he found only one with fire fighting appliances and recommends that they all be equipped with either extinguishers or hose and water.

Electric Fire Pumps

Architects and builders generally may be interested to know that the building rules of New York City now permit the use of electric pumps for fire purposes. Heretofore steam pumps have been specified. We recall an instance in which, were a fire to start in the night in one of the large public buildings of the city, it would be necessary for the manager to telephone to the engineer to come to the building, some distance from his home, where he would have to build the fires to start the steam pump to supply water to put out the fire. It is safe to say that in this instance the pump



AUTOMATIC, INDESTRUCTIBLE FIRE PUMP AT THE HUDSON THEATRE, PHOTOGRAPHED THROUGH A NARROW DOORWAY.

represents simply technical compliance with the law, and that it would be of absolutely no value should a fire occur in hours other than those in which the engineer is on duty. With an electric pump all is different. It starts and stops automatically with the movement of the water in the supplying tank. If the water, or the pressure, as the case may be, falls below a predetermined point the pump starts; when the water again reaches that point the pump stops.—*Bulletin, New York Edison Co.*

Fire Fighters of The Olden Time

It is difficult for the human mind to realize that the world progresses and improves. The majority of men stoutly maintain that there are no times like "the good old times."

This is peculiarly true of the old time fire fighter. Like the Old Guard, he dies but never surrenders his belief in the superiority of the old volunteer fire department to the new fangled ways of the present day.

The recent death of one of the old New York Fire Department bell ringers, has awakened some reminiscences of the past. But two of his old time co-workers in the bell tower survive him.

One in Henry acoby, who joined the Volunteer Fire Department in 1858 and was appointed ringer of Mount Morris bell in 1864. The other is John Campbell, who became a volunteer fireman in 1848 and was put in charge in 1863 of the Jefferson Market bell, which he rang for nine years.

Before 1865 the bell ringer's job was the only paid one in connection with the Fire Department, and in nearly every case the appointment was secured by one who had served with zeal as volunteer fireman.

These old time bell ringers hold to the belief that but for the degeneracy of the nerves of New Yorkers they would still be working at the old stand in the good old way.

Former bell ringer John Campbell is now seventy-six years old and still does a good day's work every working day. Here are some of his views on the subject:

"When I first got my job, Gen. Shaler, Martin B. Brown and Philip W. Enges were Fire Commissioners, and the rule was to give seven rounds of signals for every fire. But before long orders came to give only five rounds, and again to let up at three rounds.

"Why? Well, there were some nervous people who objected to the noise, we were told. But besides the three rounds, if a fire seemed to be getting headway we sent out a second alarm of three rounds more, and often a third alarm.

"Hard to see the beginning of a fire? We didn't find it so, the towers were 100 feet high, topped with an octagon shaped glass cage something like a pilot house, and the ringer had a powerful marine glass to help him in his search.

"There were eleven of these wooden towers in what is now Manhattan—the farthest north situated at Mount Morris. That is now the only one left standing.

"Some of the other towers were at Eighty-sixth street and Third avenue; at Thirty-third street, near Tenth avenue; at Jefferson Market, at Spring and Varick streets, at Essex and Grand streets, at Marion and Spring streets, at Liberty and Nassau streets, and at Union Market, at the foot of Houston street.

"New York was pretty thickly populated around Eighth street even then, and Jefferson Market bell was one of the busiest. Every tower was connected with the others and with Fire Department Headquarters by telegraph, but not with the engine houses, which was a help to the bell ringer. You see, sometimes he might have his back to a fire which was just starting up, be looking the other way, and perhaps the fire would be spied by the man in the next nearest tower. In that case, as soon as he spied it he would send a signal to tap the bell which ought to give the alarm.

"Why, yes, we could guess pretty nearly right, even at night, the location of a fire, for it was part of our business to learn the exact location of every conspicuous building, the church steeples, flagpoles and different sorts of lights which would serve as landmarks.

"There were three of us ringers to every tower and each was on duty eight hours out of the twenty-four, taking turns, of course, at the night trick, as we called it Each got $1,000 a year—pretty good pay for those days.

"When the fire alarm boxes were put up at the street corners, about '75, the bell ringers were cut out of a job and not one of us but was sorry. After that I went to work in the Fire Department repair shop for several years, and now I am employed in a furniture store."

Captain Sullivan, of Engine 23, Manhattan, is perhaps the oldest Fire Department Chief in the city. He was formerly a volunteer fireman and sighs as he thinks of the good old days. "In those days," said he, "men could run faster than they can now. They liked to run.

"Horses couldn't beat them. If the roads were heavy they took to the sidewalk. Anything so they got there. Only active men joined a volunteer fire company, for a man that got run out going to a fire, was a laughing stock ever afterward for the others.

"Some of the finest men in New York in those days were volunteer firemen. Mayor Tiemann, Mayor Wickham and Mayor Gunther joined our association, and the members included many of the principal merchants of the city. It was considered quite an honor to belong to it, and not every candidate was accepted.

"Young men had fewer amusements then than they have now, and running to fires was something of a hobby with them. And employers never thought of docking employees for dropping work and rushing to a fire if they belonged to the association. One day I saw sixteen men who worked for a plasterer drop their trowels and run when the fire bell rang, and their boss never said a word.

"A first-class company was allowed seventy men, a second class sixty, a third class fifty, a hook and ladder forty, a hose thirty.

"Did the vounteers take as many risks as paid firemen do? They took a good many more. Volunteer firemen often worked far more enthusiastically than paid firemen ever think of doing.

"When it comes to courage at fires, volunteer companies sometimes go ahead of the regulars even now. I saw an instance of that not so very long ago.

"There was a pretty big fire up in The Bronx and although I answered the alarm with all the speed we could make, the top floor of the building was almost in cinders

when we got there. Two volunteer fire companies, one of them from City Island, were on the ground almost as soon as we were and I really held by breath to see the way those men took hold.

"They were agile as monkeys and seemed to be all over the outside of that burning structure in five minutes.

"In the riots of '63 the volunteer firemen did far more effective work than the police, I think, for not only did they labor hard to put out every fire that was started but afterward they turned to and licked the mobs—or tried to.

"The volunteer fire company was just like a big family in those days, and, instead of shirking, every member tried to outdo the others in pluck. And how some of us enjoyed the fun!"

The Chattanooga Convention

THE Thirty-second Annual Convention of the International Association of Fire Engineers, was held at Chattanooga, Tenn., on September 13, 14, 15 and 16.

The people of Chattanooga made elaborate preparations toward the entertainment of the delegates. Among the pleasant features arranged was a carriage drive over the Chickamauga battle fields, which proved to be one of the most interesting features of the stay in the city.

An instructive feature of the convention was the mammoth display of fire apparatus. The leading manufacturers of the world were represented and there was displayed the latest and most improved fire fighting devices.

The convention opened with about 600 delegates in attendance. A parade in which fully 250 Chiefs participated was an auspicious preliminary. The first session was attended by 1500 people. The convention was called to order by President W. B. Joyner, of Atlanta.

Chief Joyner enjoys the great distinction of being the first southern man to be placed at the head of an international association, and the fact that he was elected without any solicitation upon his part but served to augment the highly deserved honor.

Chief H. A. McQuade, of Chattanooga, introduced Mayor A. W. Chambliss, who delivered an eloquent address of welcome. Chief Isaac B. Hyatt, of Meridan, Conn., made a glowing response to the address of welcome on behalf of the association.

The first business session of the convention was called to order by President Joyner in the afternoon.

The report of the Credentials' Committee was ordered adopted. The following committee on exhibits was appointed: T. F. Owens, of Denver; C. F. E. Coates, of Indianapolis; W. H. Bywater, of Salt Lake City; L. M. Jones, of Macon, Ga., and C. H. Swan, of Providence.

The Executive Board called the attention of all who attended the convention to the following advice:

"Information on fire fighting and prevention are the fundamental principles on which our association is founded. It is earnestly desired that each and every chief attending our convention present any question they desire discussed. Do not feel backward because you represent a small department, but speak out; for you may open a debate that will be of deep interest to all Fire Departments of the country."

The memorial exercises at the New Opera House last night were very impressive. The theater was appropriately decorated and on the stage was a large bronze figure of a fireman in uniform, holding with his left arm a child, and in his uplifted right hand a lamp. The figure represented a fireman saving a child from a burning building. In front of the figure was a large book, electric lighted, containing the names of members who had died. Suspended from the top of the building were a hook, ladder and ax, implements of the fireman.

The contest for the meeting place of the next convention was warmly but good naturedly waged. The rival claimants were Duluth and Dallas, but the final ballot showed that Duluth was selected, the vote being 85 to 74. In presenting the claims of Duluth, Chief Black, of the Fire Department of that city, said:

"Duluth, Minn., situated at the westerly extremity of Lake Superior, and having a population of 75,000, is one of the healthiest sections in the United States. The air is bracing, there is no malaria or hay fever, the drinking water is soft, pure and abundant, and cannot be equaled anywhere in the world.

"Our port, situated midway between the oceans, has a large volume of business, has more iron and copper ore, more agricultural and grazing country tributary to it than any port in America.

"The Duluth entrance is provided with concrete piers of the finest construction found on the lakes, and the Superior entrance has piers now equally as good under construction. Across the Duluth entrance a novel aerial bridge, the only one of its kind in America, with a span of nearly 400 feet, and a height of 188 feet, is in progres of erection.

"The great grain and stock raising reserve of the North American continent, capable of supporting 50,000,000 people, is just west and north of us. This district now makes flour enough made into loaves of bread to girdle the earth, and butter enough to cover it. It produces enough iron each year to girdle it many times, and is the present and the future iron producing region for the entire world.

"We have a most excellent convention hall, which would be furnished for the use of the convention without charge. We have some of the best hotels in the State with ample accommodations to the convention."

When the time arrived for the election of officers for the ensuing year, Chief Horton, of Baltimore, Md., placed in nomination Chief Joyner, of Atlanta, Ga. Chief Doane seconded the motion. Ex-Chief David E. Benedict, of Newark, N. J., also seconded the motion. He said the association has the utmost confidence in President Joyner. Chief Fuller congratulated the president and members of the association on the attendance upon the convention. He said this, the largest attendance upon any convention of this association, was brought about by hard work on the part of the president. President Joyner was then re-elected president of the association by acclamation amid great enthusiasm.

The new president responded, by saying that he had been a member of the association since he was a mere boy, and this was the twentieth convention he had attended. Some of the best friends he had in the world were members of the association.

First Vice-President John Stagg, of Paterson, N. J., was placed in nomination and unanimously re-elected.

Chief Haney, of Jackson, placed in nomination for second vice-president Chief George M. Kellogg, of Sioux, Ia., who was also re-elected with applause.

For secretary, ex-Chief Benedict said he desired to place in nomination the old war horse, who had been sitting in the chair until he had become baldheaded, Chief Henry A. Hills, of Wyoming, Ont. Chief Hills' re-election was unanimous.

Chief Tyson said, for treasurer he desired to place in nomination Chief Daniel C. Larkin, of Dayton, O. Chief Larkin's re-election was also unanimous.

A Veteran Chief of Police

CHIEF OF POLICE JOHN H. SMITH, of Guttenburg, is seventy-five years old and is probably the oldest official bearing that title in the country. Besides being chief he is also the whole department. He is also ordinance officer of the town and in fact he holds numerous other titles. Notwithstanding being so important a functionary the chief receives the munificent sum of $30 per month. The chief is always in uniform, but has a special one for Sundays and state occasions. He has held these innumerable offices for over half a century and is the only salaried appointive official.

When the chief went through the town on his birthday he received the congratulations of all who met him. Rumor had it that the chief, who is a widower, intends shortly to be married. When spoken to upon the subject the chief was blushingly reticent. At present the aged official is enjoying good health, having successfully fought through two attacks of pneumonia during the past winter.

With relatives the chief celebrated his birthday at the home of his daughter, Mrs. Julia Stocker. The death of the guest of honor was toasted and the chief said he felt as though he was good for twenty-five years more, when he would attain the century mark. He received many presents and floral pieces, one a horseshoe with the figures "75" inscribed with immortelles.

He was one of the liveliest of the party and enjoyed several waltzes and two-steps with his daughter.

Fire and Police Personals

—The City Council of Alexandria, La., has completed the investigation of charges against Chief of Police Roberts, for which he was suspended. After a considerable amount of testimony and a lengthy argument by three attorneys, the City Council brought in the verdict: "That City Marshal H. R. Roberts is suspended from the office for ninety days from this date without pay."

—The Bristol, Va., Council recently elected Samuel D. Keller, Chief of Police. Mayor Rice advocated the retention of the old Chief, W. B. Kilgore, but was out voted.

—Samuel W. Huston has been elected Fire Chief of Coatesville, Pa.

—The members of the Kearny, N. J., Police Department presented their Chief, William Tolen, with a gold badge on September 9. The badge is surmounted by an eagle. The eye of the bird is a diamond. On the face of the badge are the words: "Chief of Police, Kearny, N. J." On the back of the badge is inscribed: "Presented to William Tolen by his friends and members of the Police Department, September 9, 1904." Mr. Tolen was appointed Chief of Police May 1, 1899.

—The Board of Education of Racine, Wis., saves $200 by having Chief of Police Phister act as truancy officer.

—Police Sergeant Joseph Shilling, of Philadelphia, has completed thirty-nine years of continuous service on the force. At seventy-eight he refuses to be pensioned and insists on doing active duty.

—Fire Chief Little, of Rochester, N. Y., has been very busy lately reorganizing the department, which is now one of the most efficient in the State.

—Fire Chief Ed. Eastham, of Beaumont, Tex., was recently granted thirty days leave of absence by the City Council.

—Chief of Police A. Gerald, of Montgomery, Ala., was recently obliged to suspend one of his patrolmen for being asleep while on duty.

—Ex-Chief Eli Bates, of New York, was one of the most prominent firemen who attended the New York State convention.

—Chief Frank House, of Owosso, Mich., has reorganized the Fire Department of that town.

—Chief Dittman, of the Bremen, Germany, Fire Brigade, is to visit America to study fire-fighting methods. Bremen has had four new stations in the last two years, on American plans, and a fifth one is under construction. In addition the fire alarm system has been remodelled after American designs.

—Charles E. Peck, Chief of the Chicago, Ill., Volunteer Department, died August 13.

—Chief Maxsom, of Gloversville, N. Y., has commenced the drilling of the firemen in the use of scaling ladders and other life saving apparatus.

—Several firemen suspended for incompetency by Chief Tanner, of Zanesville, O., have filed a reply and propose to fight the matter.

—J. W. Sutherland, of Fargo, N. D., has been appointed Chief, and Edward Manning assistant, of the new paid Fire Department.

—Among the ex-Chiefs who participated in the annual parade and review of the Oswego, N. Y., Department, were Hon. Frank M. Baker, ex-secretary of State Association, and his son, George H. Baker, who retired recently. Father and son are not often seen as ex-Chiefs in a Firemen's parade anywhere.

—September 1 Chief Meminger, of Milwaukee, celebrated his thirteenth anniversary as a member of that department. He was born in Milwaukee. Chief Meminger was presented with a diamond-studded gold badge.

—Captain Columbus W. Worley has been elected Chief of Police and Oscar M. Bledsoe Assistant Chief of Carrollton, Ga.

LITERATURE ON MUNICIPAL TOPICS*

Reviews of Some Important Books—What the Magazines and Reviews Have to Say About Civic Affairs—Municipal Reports Received

The fourteenth edition of the "Architects and Builders' Pocket-book," by Frank E. Kidder, C. E. Ph. D., is at hand. Mr. Kidder is a consulting architect and structural engineer; a Fellow of the American Institue of Architects and author of "Building Construction and Superintendence." The "Pocket-book" is illustrated with one thousand engravings, mostly from original designs.

It is nearly twenty years since the author completed the first edition of this work, which, although containing but 586 pages required three years for its preparation. In preparing the present edition the author had in view:

1st. A reference book which should contain some information on every subject (except design) likely to come before an architect, structural engineer, draughtsman, or master-builder, including data for estimating the approximate cost.

2d. To as thoroughly cover the subject of architectural engineering as is practicable in a handbook.

3d. To present all information in as simple and convenient a form for immediate application as is consistent with accuracy. To this end a great many new tables, arranged and computed by the author, have been inserted.

At the time the first edition was written, the term "Architectural Engineering" had not been used in its present application, and the term "Structural Engineering," when used, referred almost exclusively to bridge work.

To-day, structural and architectural engineers are concerned almost exclusively with building construction, and their work is more closely allied to that of the architect than to that of the civil engineer; hence the author has had in mind the needs of the structural engineer and draughtsman as well as those of the architect and builder, and the book should be of nearly equal value to both. Morocco, pp. 1,656. Price, $5.00.

♣

"How to Judge Architecture; a Popular Guide to the Appreciation of Buildings," is a comparatively new work by Russell Sturgis, A.M., Ph. D., whose "Dictionary of Architecture and Building," "European Architecture," etc., have already fixed his status as a strong and graceful writer on the subject. Mr. Sturgis' latest work is profusely and beautifully illustrated with half-tone plates of notable examples of the ancient and modern architecture of the world.

Mr. Sturgis preaches patience as the keynote in trying to train the mind to judge of works of architecture, believing that it is very easy to hinder one's growth in knowledge by being too ready to decide. There are no authorities at all, the author thinks, in the matter of architectural appreciation; the only opinions or impressions, or comparative appreciations that are worth anything to the student are those which he will form gradually for himself. "He will form them slowly, if he be wise; indeed, if he have the gift of artistic appreciation at all, he will soon learn to form them slowly." Mr. Sturgis is of opinion that there is no serious dispute as to the standing of the Greek architecture previous to the year 300 B. C., as the most perfect thing that decorative art has produced. He warns the student against o'erweening admiration of ruins, and says: "Admire the ruin to your heart's content; but be careful that you do not allow too much of this romantic association to enter into your love of the artistic entity, of the lost Parthenon, which we have to create out of the air, as it were. And beware of the admiration of ruins as you would of the 'tone' given to a picture by time. It is not that which the artist proposed to himself or even thought of, and it is the artist's purpose that you must ask for, always."

The twentieth century, the author says, is not as yet certain to be a great day of art in the decorative or artistic sense. There are, however, a few works of art which show that the power of thoughtfully working out a complex design is not wholly lost to the world. Cloth; pp. 221; $1.50 net.

♣

"A Chemical Survey of the Waters of Illinois," is the title of a volume containing the report for the years 1897-1902, by Arthur William Palmer, Sc. D., professor of chemistry in the University of Illinois. Among other subjects embraced by the report are the water supplies of the State, their sources and analyses; the geology of Illinois as related to its water supply (by Charles W. Rolfe), and an investigation of the waters of the Illinois River. The report is published by the University of Illinois.

♣

A volume containing the "Proceedings of the Municipal Engineers of the City of New York and Constitution, By-laws, List of Members and Annual Report for 1903" is at hand. The work is published by the society, of which Andrew J. Provost, Jr., is editor. The volume contains a paper on "Park Engineering in the Burroughs of Manhattan and the Bronx," by Nelson P. Lewis, member of the society; "The Old Roman Aqueducts," by Edward Wegmann; "Rapid Transit in New York City," by George S. Rice; "Some Street Traffic Problems," by Wisner Martin; "The Problem of the Maintenance of Asphalt Pavements in Manhattan," by James C. Bayles; "The Investigation of New Sources of Water Supply for the City of New York," by A. S. Tuttle, W. W. Brush and D. D. Jackson. The volume contains maps and is copiously illustrated with half-tone plates.

* Any book or periodical reviewed or mentioned in THE MUNICIPAL JOURNAL or elsewhere, will be sent to any address on receipt of price.

Periodicals

The Outlook for September 3, contains three interesting articles on municipal subjects: *The Grouping of Public Buildings,* by Milo Roy Maltbie; *Boston Vistas,* by J. T. Trowbridge; and *Beautifying the Urban Back Yard,* by Bertha D. Knobe. Price, 10 cents a copy or $3.00 per year.

In *The Engineering Magazine* for September is a timely as well as an excellent illustrated article by the late H. C. Fyfe, entitled *The New York Rapid Transit Subway.* Price. 25 cents a copy or $3.00 per year.

The second part of *Subway Construction,* by D. R. Craig, is started in the September number of *Telephony.* Price 10 cents a copy or $1 per year.

Practical Cement Control is the condensation of a paper read before the American Society for Testing Materials, by Dr. Charles F. McKenna, and is published in *The Engineering Record,* New York, August 27, 1904.

The Engineering Record for September 3, 1904, contains among other items: *The First Street Tunnel at Washington —I; The Failure of the Oakford Park Dam, Near Jeannette, Pa.; Tests on Reinforced Concrete Beams,* a paper read before the American Society for Testing Materials, by Professor F. E. Turneaure, dean of the College of Mechanics and Engineering; *A Diagram for the Flow of Water in Pipes,* by Ernest W. Schoder; *Cleaning a Water Works Reservoir by Dredging,* by F. B. Marsh.

Location of Electric Stations, by Mr. Alton D. Adams, is a continued article begun in *American Gas Light Journal,* New York, September 12, and finished in September 19 number.

The Chautauqua, for September, 1904, contains two very interesting articles. *Civic Lessons from Europe,* by Milo Roy Maltbie, assistant secretary of Art Commission of New York, and *Recent Scientific Contributions to Social Welfare,* by Professor H. W. Conn., of Wesleyan University.

Foreign Periodicals

The Conservation of Subterranean Water Supplies and the Bearing of Geology Thereon, by William H. Maxwell, A. M. Inst. C. E., borough and waterworks engineer of Tunbridge Wells. This paper was read at the annual congress of the Royal Institute of Public Health, held at Folkstone recently. *Municipal and Suburban Water Supplies of Brussels,* by Easton Devonshire, A. M. Inst. C. E. *Recent Experience in the Treatment of Manchester Sewage,* by Gilbert J. Fowler, D. Sc., F. I. C. This paper was read at the annual congress of The Sanitary Institute held at Glasgow recently. All of these articles are published in *The Surveyor and Municipal and County Engineer,* London, Eng., August 19, 1904.

The Engineering Times, London, August 18, contains *Some Tests of Reinforced Concrete,* by C. Alfred Smith, B. Sc., A. M. I. M. E., and *The Disposal of Institutional and Trade Waste,* by W. Francis Goodrich, A. I. Mech. E. The latter paper was read before the Royal Institute of Public Health, in July.

Sewage Disposal on Chalk Soils, by Lieutenant-Colonel A. M. Davies, R. A. M. C. and W. C. Tyndale, M. Inst. C. E., is in *The Surveyor and Municipal and County Engineer,* London, Eng., August 26, 1904. In the supplement of the same number is an article on *Derby Public Baths.*

At the annual congress of The Sanitary Institute, held at Glasgow, recently, two excellent papers were read before that body. They were: *Shell Fish and Infection,* by Dr. Newsholme, Medical Officer of Health for Brighton; and *Pollution of Rivers by the Sludging of Mill Dams,* by Mr. Arthur F. Somerville, chairman of the Somersetshire County Council. These papers are both printed in *The Public Health Engineer,* London, Eng., August 27, 1904.

Improvements in Towns Cleansing, by W. H. Eccles, Cleansing Superintendent of Stockport, is a paper read before the Annual Conference of Cleansing Superintendents held at Aberdeen on June 28, 1904, and printed in *The Sanitary Record and Journal of Sanitary and Municipal Engineering,* London, Eng., August 25, 1904.

Epidemic Diphtheria, by Alexander M. Erskine, M. D., B. Ch., D. P. H., Medical Officer of Health, of Goole, England. This paper is a brief account of an epidemic of diphtheria that occurred in Goole and which lasted from September, 1901, to October, 1903. It is printed in the September, 1904, number of *Public Health,* London, Eng. Price, 1 shilling.

Power Plants—I., by F. W. Brookman, is in *The Surveyor and Municipal and County Engineer,* London, Eng., September 2, 1904.

In *The Sanitary Record and Journal of Sanitary and Municipal Engineering* for September 1, 1904, is the beginning of an article on *Hygiene in China,* by Arthur Stanley, M. D., B. S., Lon., D. P. H., Health Officer of Shanghai, China. This magazine is published in London, Eng., at 17 shillings per year or 3 pence per copy.

Municipal Documents Received

—Illinois State Board of Health Report for 1801-2. Dr. James A. Egan, Secretary.

—Report of Health Officer, District of Columbia for 1903. Dr. William C. Woodward, Secretary.

—Report of Comptroller, St. Louis, Mo., for 1903-4. Mr. James Y. Player, Comptroller.

—Fifth annual report of Superintendent of Water Works, Charlotte, N. C. Mr. C. H. Campbell, Superintendent.

—Eighth annual report of Superintendent of Public Works, Niles, Mich. Mr. John A. Cavanaugh, Superintendent.

—Department of Public Safety Report, Syracuse, N. Y., for 1903. Mr. Ralph S. Bowen, Commissioner.

—Fire Department Report of Youngstown, O., for 1903. W. H. Loller, Chief.

—City Engineer's Report, Haverhill, Mass., for 1903. Robert R. Evans, City Engineer.

—Thirteenth annual report of Secretary of State Board of Health of Michigan.

—Ninth annual report of the Public Lighting Commission, Detroit, Mich. Mr. John Erhard, President.

—Report of Park Commissioners of New Bedford, Mass., for 1903-4. Mr. James E. Moore, Chairman.

REVIEW OF MUNICIPAL REPORTS

Cities Should Keep Streets Clean and in Repair—Water Department Should Receive Hydrant Rental—St. Paul's Trouble with Electrolysis

Clean Streets Advertise a City

FILTHY streets and impure water supply was the burden of the report of City Engineer C. B. Cooke, of Wheeling, W. Va. He said that the city could not be proud of the condition of its streets and a city cannot keep its streets clean by doing the work by spurts, but it must be done systematically and constantly. If the streets were in better condition it would be easier to keep them clean. The city should have a modern street sweeper and the paved streets should be constantly washed with hose. Clean streets are one of the best advertisements a city could have. Regarding the water supply, Mr. Cook stated that the source was naturally impure and, with the increase of population in the Ohio valley, the pollution will increase. The reservoir holds but one-fifth of the city's daily supply, giving no chance for the water to settle, consequently the city drinks water straight from the river. What the city needs is a large storage reservoir and the sooner this work is done, the better will be the health of the people. He asked that an ordinance be passed requiring property owners to lay all services for water, gas, and sewers on notification that the city is to pave the streets, and providing that the city do the work on failure of the property owners to comply with the notice within ten days.

Newark's Water Department in 1902

An instance of lateness in getting out a department report, all too common in many city departments, is that of the report of the Water Department of the Street and Water Commissioners of Newark, N. J. A comparison is made of the revenue from water for 1901 and 1902 which shows a decrease of over $5,400. There was a slight increase of revenue from metered water. The revenue from special water contracts showed an increase of over $15,650, which made a net gain of water revenue of $10,250. The net increased revenue and actual cash on hand were about the same as were the amounts due for water in both years; therefore the expenses for each year must have been about the same. The work of extending the street mains during the year amounted to 28,876 feet, of which 26,541 feet were of 6-inch pipe. This brings the total length of pipe in the system up to 278 miles, 822 feet. Two and a quarter miles of pipe were relaid or lowered. During the year 146 hydrants were placed in position, making a total of 2,275 hydrants in service. The total number of new service during the year amounted to 994, and the number of new water takers 1,007. There were 1,772 meters set in 1902, making the total number in use 13,274. The total number of hydrants on the high and low service is 2,388. For the last ten years, the daily average consumption has increased from 15,000,000 gallons in 1892 to about 26,700,000 in 1902, the highest point being reached in February, 1899, when the consumption averaged 32,500,000 gallons. A careful inspection is maintained on the water shed. The city owns many tracts of timber land about the reservoirs, which are being treated by the State Forester. Superintendent Sherrard recommended that the open spaces be planted with trees and treated in the same manner as the wood land.

Hydrant Rental Demanded by Water Department

Two main features of the report of the Board of Water Commissioners of St. Paul, Minn., for 1903, was in regard to hydrant rents and electrolysis. No rental was paid for hydrants by the city for twelve years, and but $20,000 was appropriated for this purpose in the budget of 1904, a small amount of what is due. There are forty-four large office buildings which get their drinking water from artesian wells and therefore pay nothing to the water department, notwithstanding the fire protection they receive from city water. Either full hydrant rental must be allowed the Water Department or a large appropriation be made for extensions. Trouble with the street railway over electrolysis of water mains has been partially settled, the company having paid for the expenses of inspection by the city and having agreed to reimburse the Department for replacing, in future, mains damaged by electric action. It agreed to submit a plan by October, 1904, to prevent further damage, failing which, the Department is to continue its legal contest. The reports of Secretary John Caulfield and Superintendent John Lindquist give the statistics about the system. There are 263.14 miles of main, 870,734 feet of which are of 6-inch pipe, remainder being 4- to 36-inch. The high-service mains amount to 183.2827 miles; the low-service, 70.42 miles, and the high-service, west side, 9.4375 miles. There are 2,445 hydrants in service, and 326 street sprinkling hydrants. There are 7,127 meters in service, and the consumption of water for 1903 amounted to 145,340,996 cubic feet, for which $113,440.96 were received, or $0.078 per 100 cubic feet. The amount received for meter rent was $13,311.66. The Water Department owns 7,024 meters in service; an increase of 663 meters over 1902 is reported.

Better Water Supply for Erie

THE water commissioners of the city of Erie, Pa., have been struggling with the problem of how to furnish the city with water free from sewage contamination. For twenty-two years the water department has called the attention of the councils to the pollution of the water in the bay from which the city draws its supply. Pure water could be obtained—first, by the building of an intercepting sewer, which would prevent the sewage from entering the bay; second, by building a filtration plant; third, by extending the intake pipe into Lake Erie. The department has offered to bear a large part of the expense incurred in the construction of an intercepting sewer and sewage disposal plant. The commissioners are of the opinion that it would be better to extend the intake pipe one mile into Lake Erie, and then build sedimentation basins for the storage and clarification of the water. When it becomes necessary to filter the lake water, a filtration plant can be built on land already owned.

THE WARREN BITULITHIC PAVEMENT

City Council Committee of Cincinnati Enthusiastic in Its Favor After a Thorough and Exhaustive Investigation—Recommend It Highly

The Council of the City of Cincinnati recently appointed a committee to investigate the merits of the Barren Bros.' bitulithic pave ment and to gather all facts concerning it. On August 29 the committee reported to the Council that after an exhaustive investigation, during which the pavement was thoroughly inspected in a number of cities, they were strongly in favor of the adoption of this pavement for their own city, and that as a result of their researches they enthusiastically endorsed the pavement as being all that was claimed for it. The verbatim report of the committee is as follows:

Honorable Council of the City of Cincinnati.—*Gentlemen:* Your Special Committee appointed by the Council with instructions to investigate and report to this Council their findings in regard to the Warren Brothers' bitulithic pavement, beg leave to submti the following report:

Your Committee visited a number of cities, and inspected a number of streets laid by the Warren Brothers.

On Wednesday, August 17, your committee visited the city of Yonkers, N. Y., and made an inspection of Undercliff street, which has been laid for three years, and has a grade of 13 per cent. This street was in perfect condition, as good as the day it was laid, and seemed to have no wear for the three years' use, and looked to be in as good condition as if it had been laid one week. Alta avenue, Yonkers, N. Y., was laid three years ago, has a grade of 6 per cent., and was found to be in perfect condition also. Morgan street, Yonkers, N. Y., also a three-year-old pavement, with an apparent flat surface, was found to be in first-class condition.

Bitulithic Pavement in Boston

On Thursday, Aug. 18, the committee visited Boston, Mass., and inspected quite a few streets. The first street visited was Hancock, and it has been laid for a period of three years, and has a 7 per cent. grade. This street was in perfect condition, and inquiries made from a number of carriage drivers and teamsters as to the durability of the street, and whether it at any time interfered with driving, your committee was informed that the horses seemed to be very much at home on the street, and there was no danger of slipping, either in wet or dry weather. After questioning people who drove, such as automobile and carriage drivers, the committee was informed and reached the opinion that it is a perfect street as far as driving of horses is concerned, and very much superior to any street in use in the neighborhood.

Your committee visited Bowdoin street, which was laid three years ago, and has a grade of 9 per cent. and 12½ per cent. The committee drove over this street in carriages and noticed that in driving either up or down grade the horses had perfect footing, and at no time slipped, but seemed to be perfectly at home, either up or down grade. Berkeley street was also visited (Boston). This street was laid two years ago and was in splendid condition. Dartmouth street, Boston, two years old, was in perfect condition. Newton street and Belvidere street, Boston, Mass., laid two years ago, were in perfect condition, as good as the day they were laid.

Brookline Paved with Bitulithic

Brookline, Mass., too, was visited, and Harvard street was the first to be inspected. It was laid two years ago, and is subject to heavy travel, and was in the best condition. Washington street, Brookline, Mass., was laid three years ago, and subject to heavy travel, and was found to be in perfect condition. The committee had the pleasure of meeting Mr. Michael Driscoll, superintendent of streets, of Brookline, Mass., who showed the committee every courtesy and answered all questions regarding the durability of the street. He praised the street very highly, and said he considered it the most perfect street ever laid in that section of the country; that it gave entire satisfaction, and no complaints were made. He also stated that they were preparing to lay numerous other streets in Brookline as fast as the money was available for same.

On Thursday your committee visited Cambridge, Mass., and here met Mr. George A. Clukas, superintendent of streets of Cambridge. He showed the committee every courtesy possible, and took them over a number of streets, especially Temple street, which had been put down four years ago, and was subject to lots of heavy travel. He told the committee that either in wet or dry weather there was no complaint ever made of horses slipping or vehicles slipping, and that he considered it the best street ever laid in that part of the country, and just as soon as the money was ready they were intending to lay a number of streets in Cambridge.

Bitulithic Laboratory at Cambridge

The committee was taken through the laboratory at Cambridge, where the Warren Brothers' Bitulithic Pavement is constructed, and saw the method of construction. The superintendent of tests showed the committee the manner and method in which they made tests as to the good condition and durability of the bitumen used in the laying of the Warren pavement. He showed a number of samples taken from streets paved with the Warren bitulithic pavement, and at the time the committee was there he was subjecting the same samples to tests regarding the proper quantity of materials used in the preparation according to the ideas of the president, Mr. F. J. Warren. Everything was shown your committee in a satisfactory manner.

Your committee visited Salem, Mass., on Thursday, Aug. 18, and inspected Lafayette street. This street was laid two years ago, and was found to be in as good a condition as a newly laid street.

On the same day Lynn, Mass., was also visited, and North Crescent street was inspected. This street has been laid three years, and is in perfect condition and is subject to a great deal of travel. Center street, which was laid this year, seemed to be in no better condition than those streets laid three years ago. Here the committee met Claude A. Magill, Commissioner of Streets of Lynn, Mass., who extended every courtesy. Mr. Magill told the committee that they were taking up macadam road, and were laying the Warren bitulithic pavement instead, as fast as the money permitted. He also said hat he considered this Warren pavement the most perfect pavement known at the present day. That it caused general satisfaction to the Fire Department, and to vehicles of all kinds, especially automobiles, as there is no "skidding," and horses seem to have a firm footing. Mr. Magill accompanied the committee along a number of roads, and answered questions and enlightened the committee on the subject pertaining to the laying of the streets.

Pawtucket Uses the Pavement

On Friday, August 19, the committee visited Park Place, which had been laid four years ago, and is situated in Pawtucket, R. I. It has a grade of 3%. This street was seen to be in perfect condition. Harvey street, 12% grade, and four years old, was visited, and the committee was driven over it in carriages. The committee noticed that the horses had made no slips in driving up grade, and requested the drivers to return and drive down the grade at a lively gait of speed. This was done, and none of the horses was noticed to make any slips up or down. Inquiring of the drivers of vehicles in Pawtucket, the committee learned that the street was perfectly satisfactory, so far as complaints having been made by drivers of vehicles, automobiles, bicycles, and, in fact, no complaint had been made to the proper authorities whatever.

Cottage street, Pawtucket, was this year's work. Lonsdale avenue was under construction at this time, and the committee had the pleasure of seeing the street made and laid to the very best advantage, which enabled the committee to gain a knowledge of how the street was made. Mr. Walter B. Warren was requested by the committee to have a piece of the pavement, which had been laid a few weeks, cut out, on Lonsdale avenue, and it be given the committ e which he really did. The same request was made concerning Park

place, which had been laid four years. Also a piece cut from Harvey street. All of which was done to the satisfaction of the committee and are now on exhibition in the Engineer's office for further inspection of any one desiring to make the same.

The committee met George A. Carpenter, at Pawtucket, City Engineer of said city, and William H. Barclay, Commissioner of Public Works, who informed the committee that the streets laid in Pawtucket had given the best of satisfaction, and as soon as the money was available, they intended to lay no other kind than the Warren Brothers' bitulithic pavement.

Pavement Especially Noiseless

The committee found that the streets inspected have a smooth finished surface, similar to asphalt in appearance. This pavement was especially noiseless. While on Harvey street, Pawtucket, the committee requested to be driven rapidly up and down this street, it having a 12% grade. This was done without any slipping. The traction seemed very easy to the horses. This quickly showed the availability of bitulithic for grades and a good foothold for horses.

The committee has been convinced of one thing, that is, that the macadam roads of our steep grades can be overcome by the use of the Warren Brothers' bitulithic pavement. If properly laid the committee thinks that no washout can occur. The durability of the street is something which at this time cannot be solved, but the committee is willing to back the assertion that the Warren Brothers bitulithic pavement, if properly laid, will last from 25 to 35 years with very few repairs.

At Boston, Thursday, August 18, the committee had the pleasure of meeting the Hon. J. M. Head, ex-Mayor of Nashville, Tenn., who told the committee that during his two terms as Mayor of Nashville, he had endeavored, and was successful in having laid in the streets of Nashville, the Warren pavement, much to the satisfaction of all citizens of that city. The Mayor further stated, that through his efforts the council had purchased a plant for the purpose of making and manufacturing the Warren Brothers' bitulithic, and now the City of Nashville is laying her own pavements, to the satisfaction of the citizens in general.

Paving Plant in Operation

While in the city of Pawtucket, the committee was shown a plant in operation, which is run on a scientific basis; that is, the different materials are measured and weighed, such as the stone and sand and also the bitumen. These are placed in a mixer and after being thoroughly mixed are placed in a wagon. This wagon the committee followed to Lonsdale avenue where the Warren Brothers were laying this pavement. Here the committee had the pleasure of seeing the pavement laid in its entirety from the stone being rolled in the foundation and one of the men sprinkling the broken rolled stone with bitumen, and a wagon driving over it and depositing its load of varying sizes of stone and bitumen, which it had brought from the plant (in ten minutes) and the Committee saw this load weighing 6500 pounds, driven over a portion of Lonsdale avenue, which had not been laid two hours, and to the committee's surprise, this heavy load did not make a dent in the newly finished street.

Features Which Commend Bitulithic

The chief features to commend this pavement are:

1. Its freedom from mud and dust. The surface can be sprinkled, swept, and kept entirely free from dust. If free from dust, and no attrition of the surface taking place, rain cannot produce mud.

2. Absence of any slippery surface. When wet the surface seems just as good holding as the surface of a new macadam road. There could be no side slip for bicycles or "skidding" of automobiles on this pavement. This eliminates a very dangerous condition which is the frequent cause of accidents on some other forms of pavement. Wet rubber tires get a good grip on the surface.

3. No evidence of cracking. From the ductibility of the surface and manner of construction, it would seem very unlikely the surface could crack or break up.

4. Durability. The streets inspected showed no evidence whatever of wear, washing out or breaking up. From the manner of construction it would be fair to suppose the durability is all that could be desired.

5. Although the pavement is firm and non-wearing, it is not all a "dead" surface. Horses travel freely and comfortably over it. There is a sufficient yield to the surface to prevent any injury to the hoofs or tendons of horses habitually using the pavement. Rubber tires travel quickly over it. It is a comfortable pavement to use for any kind of vehicles. Your committee had the pleasure of traveling in one day over 100 miles in autos over the larger part of this kind of pavement.

6. The surface affording a good foothold for horses, and "lively," makes the traction of heavy loads considerably easier for horses. Rubber tires, securing a grip on the slightly roughened surface, allow all power in any automobile to be used for propulsion, as is also the case with bicycles.

7. The surface can be swept and kept perfctly clean, and at any time it can be flooded and washed without any inconvenience. Being waterproof, noxious substances thrown on the pavement cannot be absorbed.

8. The color of the surface is a dull gray, very restful and pleasant to the eye, and not at all likely to radiate heat. It presents a well finished, well kept appearance.

9. No cross-walks are needed, the street being free from mud and dust, the pavement is suitable for the pedestrians as well as for any form of location.

10. Simplicity of construction. The pavement can be laid from curb to curb without the use of gutter-stones. No "toothings" along the car rails are necessary. The pavement is laid flush with the improved groove car rails. No headers are used at its junction with any other form of pavement, but headers can be used where car rails are laid in streets if it is deemed advisable by the Engineer.

11. The street is easy to repair. In case of street opening being necessary, the pavement is easily removed and replaced, and if properly rolled, very little evidence of replacement is left.

12. Its noiselessness. Horses' hoofs make but very little sound on the pavement, vehicular traffic none at all, unless from the nature of the road.

13. It can be laid over the ordinary macadam road, or any other pavement, after the usual preparation and change. It can be quickly laid in sections, and is at once ready for use, entailing very little interference with traffic conditions.

14. Cost. This compares very favorably with any of the pavements now being used in our city, and we believe is very much less than has been paid heretofore for some of the pavements now in use.

Committee Recommends Bitulithic

Your committee, therefore, endorses the Warren Bitulithic Pavement and recommends its introduction and use in the avenues and boulevards of this city.

Your committee further found that conditions in the Eastern cities are more favorable to good pavements than they are in Cincinnati.

First. Because the eastern cities have an abundance of good clean, hard rock, known as trap rock, which can be bought much cheaper than rock in this city. It resembles crushed granite and it is as hard and durable as granite, while on the other hand Cincinnati has what is known as limestone, a much softer stone than trap rock, but Cincinnati can obtain a large quantity of bowlders, by dredging the river and if crushed bowlders be used in making Warren bitulithic pavements in this city, your committee is of the opinion that such streets properly laid will last from 25 to 35 years.

We believe that it would be more advantageous than any other form of pavement that could be used on Elberon, Warsaw, Glenway, Harrison avenues and Sycamore street hill. In fact on all grades of this city.

Your committee further recommends that Council enter into negotiations with Mr. Fred J. Warren with the purpose of purchasing a plant to be used by the city of Cincinnati.

We have the honor to be your Special Committee, Chairman, Michael Mullen, John Doherty, Fred Wiebking, Fred Sperber, Louis Schueler, E. O. Bathgate, Thomas McDonough.

Acetylene Gas for Lighting Towns

ACETYLENE town plants have come into favor among the smaller towns in this country and Europe quite rapidly during the past five years. The discovery of a method of manufacturing calcium carbide on a commercial scale has made the use of acetylene for general lighting purposes at a reasonable cost possible. There are to-day about one hundred and thirty towns in the United States where acetylene is distributed throughout the streets from a central plant. Considering the short time that has elapsed since the production of this gas in large quantities became possible and the great prejudice which has been encountered in its use, this number is quite remarkable and augurs well for the future of acetylene town plants. The

ACEYTELENE GAS PLANT, QUARRYVILLE, PA.

reduction in the price of carbide which is bound to come in the course of a few years as the use of acetylene increases and the patents on which the manufacture of carbide is based expire will give a great impetus to the installation of acetylene plants of all capacities.

Acetylene differs from other illuminating gases in that it is a single chemical substance and not a mixture of gases as are coal and water gas such as used in the larger cities. It is moreover a fixed gas and not a vapor as is gasoline gas. It is not affected by changes in temperature, nor does it deteriorate by piping it over great distances. The illuminating power of acetylene is 240-250 candle-power per five cubic feet consumption per hour, whereas the candle-power of coal gas is about sixteen candle-power for the same consumption. Acetylene has therefore about fifteen times the illuminating value of city gas or volume for volume is fifteen times as valuable. The burners used for acetylene are proportionately small. The sizes most commonly used are the one-fourth, one-half and three-quarter foot, while most of the city gas burners consume from six to eight and ten feet per hour.

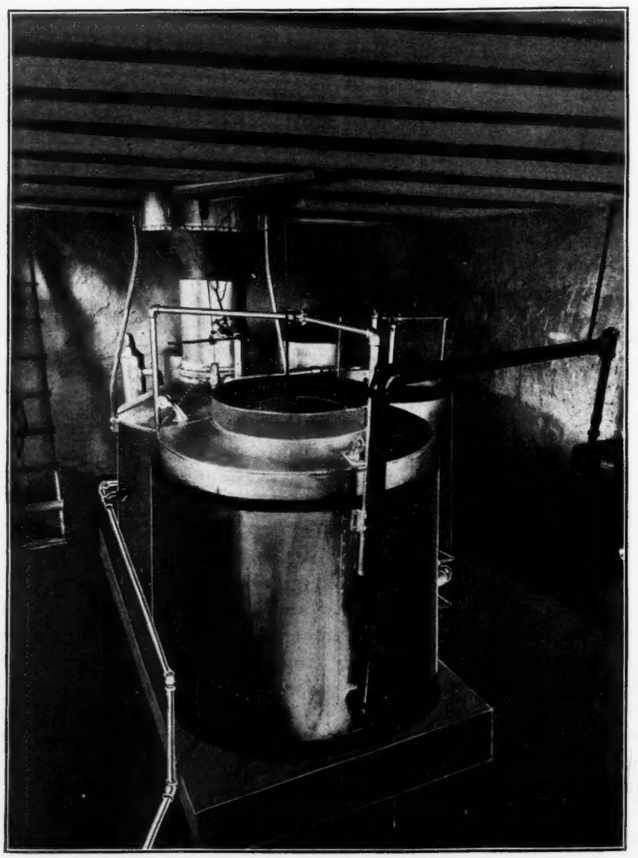
Nearly everyone is familiar with the brilliancy of acetylene light even if only in its use in bicycle and automobile lamps. Of all artificial lights it is the whitest and its spectrum comes nearer that of the sun than any other illuminant. It is frequently styled "artificial sunlight." With this light, delicate work can be done with the least strain on the eyes and for this reason is highly endorsed by eminent oculists.

To install an acetylene town plant requires a generator house and generator and a system of pipes throughout the streets. The generator house must be built frost proof. This is most easily done by sinking it into the ground. The generator should be a reliable machine and must always be ready to furnish gas. The best generators for this purpose are automatic in operation, i. e., produce the gas only in small amounts at a time and when the supply is nearly exhausted automatically generate more gas. This does away with the expense of installing a large gas holder and always insures fresh gas. The amount of attention required by the generator is an important consideration. The best machines have been so perfected that not only do they make the gas automatically, but they also remove the slaked lime automatically. This does away with all labor connected with the plant except keeping the supply of carbide replenished, which should not require more than an hour or two every few days.

The street mains for acetylene are much smaller than those necessary for any other gas. A two-inch main is the most common size. The principal feeder is generally somewhat larger and the branches 1½, 1¼ or even 1-inch pipe.

Each house supplied with acetylene is furnished with a gas meter and the gas paid for at a certain rate per thousand cubic feet, though sometimes the dial indicates candle-power similar to the system of charging ¾ to 1 or 1½ cents per sixteen candle-power electric light per hour. The usual rate for acetylene is from $1.35-$2.00 per hundred cubic feet. It must be remembered that this is equivalent to 1,500 cu. ft. of coal gas which sells from $1.00 to $1.50 and as high as $2.00 per 1,000 feet in some cities.

The cost of installing an acetylene plant depends largely on the amount of street mains that have to be laid and local conditions. From $3,000 to $6,000 generally covers the entire investment in a town of six to fifteen or eighteen hundred inhabitants. This is far less than would be required for an electric light plant for which, moreover, the operating expenses are much greater. With a first-class generator the cost of labor should not be more than $25.00 per month, and in many instances $15.00 per month is sufficient, as the



INTERIOR OF ACETYLENE GAS HOUSE, QUARRYVILLE, PA.

plant only requires a small fraction of one man's time. The machinery used is all very simple and of such a nature that it will requide very little outlay for repairs.

There has been quite a strong but undeserved prejudice in the minds of the public against the use of acetylene gas. It is generally considered a dangerous substance, and it is true that there have been a few serious accidents resulting from its use. But every single accident can be traced directly to one or two causes, either gross carelessness or an improperly constructed generator. It is safe to say that no accident has ever been caused by acetylene which under similar conditions would not have occurred with any other gas. Under high pressures, such as can be secured only by means of a compression pump, acetylene assumes the nature of an explosive and becomes dangerous, but these conditions can never be attained in ordinary practice. There is also a false belief general that acetylene is very poisonous. It is only slightly so, far less than coal or water gas, and no asphyxiation by acetylene has ever been known.

When these prejudices are overcome and the general public gets better acquainted with the unrivaled qualities of this light, then the acetylene industry will receive an impetus never dreamed of before. Small towns which until recently have either gone without a lighting system or installed an electric plant which furnished light from dusk to eleven o'clock or possibly midnight, and even then very often are laid up for repairs or shut down on account of a thunderstorm, will find in acetylene a means of illumination entirely satisfactory both from the investor's and consumer's standpoint.

Modern Transportation Facilities

NOTABLE tendencies at the present times are towards obtaining improved facilities for safe and rapid transportation, together with improved facilities at terminals for direct and economical interchange of large volumes of freight traffic between railroads and vessels. The economical freight-carrying vessel is constantly increasing in size. Ten years ago the economical carrying vessel on the Great Lakes was a three to four thousand ton vessel. To-day the carrier is a ten or twelve thousand ton vessel.

Harbor and docking facilities must be improved to permit the free and rapid passage of these vessels. This necessitates the removal of obstructive center-pier swing bridges, which are fundamentally wrong in principle because they occupy and fill the middle and best part of a navigable channel, and retard both railroad and vessel traffic, in many cases absolutely blocking modern vessels. Swing bridges give two inadequate side channels where one adequate center channel is required. If they are single-track or double-track structures they must be discarded and removed whenever one or more additional tracks are required. They must be kept narrow so as not to fill and block too much of the channel.

All of these difficulties are overcome by the modern type of Scherzer Rolling Lift Bridge, which, through improvement and development, is now also more economical in construction than a swing bridge. The great advantages of the Scherzer Rolling Lift Bridge have been recognized by the engineers of the principal railroad companies, and government and municipal engineers at home and abroad, which has led to its rapid and extensive introduction and substitution for swing bridges.

The first bridge of the Scherzer type was completed in 1894, for the Metropolitan Elevated Railroad Company of Chicago. It is a four-track structure, composed of two double-track bridges placed side by side, operated either jointly or separately, as desired. This bridge proved so satisfactory that its construction was followed by other railroad bridges larger than any heretofore constructed, notably:

The six-track Scherzer Rolling Lift Bridge for the N. Y., N. H. & H. R. R. Company at Boston, Mass., completed in 1899, and the eight-track Scherzer Rolling Lift Bridge for the P. C. C. & St. L., G. T. T., and C. J. Railroad Companies, Chicago.

The double-track, double-leaf 275-foot span Scherzer Rolling Lift Bridge for the C. T. T. Railroad Company at the entrance to the Grand Central Station, Chicago, the longest span bascule bridge ever built.

One single-track and one double-track Scherzer Rolling Lift Bridge were also constructed for the Big Four Railroad Company at Cleveland, Ohio. The latter was erected in its open position, and when completed was closed and placed into service without delaying or diverting railroad traffic.

The first double-track Scherzer Rolling Lift Bridge for the Central Railroad Company of New Jersey was placed into service several months ago, and the second is now in process of construction.

The four-track Scherzer Rolling Lift Bridge constructed at Bridgeport, Connecticut, for the N. Y., N. H. & H. R. R. Company was completed and placed into service early this year. This bridge is composed of two double-track bridges, placed side by side and operated singly or jointly, as desired.

Somewhat similar four-track Scherzer Rolling Lift Bridges are now in process of construction for this Company at Cos Cob, Conn., and also at Westport, Conn., and detail plans are now being prepared for a four-track Scherzer Rolling Lift Bridge for the same Company to span the navigable channel of the Housatonic River. These new bridges replace and supersede double-track swing bridges and form a part of the very extensive improvements of the N. Y., N. H. & H. R. R. Company, designed to expeditiously and safely handle their greatly increasing traffic.

A notable Scherzer Rolling Lift Bridge now near completion is being built for the Newburgh & South Shore Railway Company across the Cuyahoga River at Cleveland, Ohio. It is a double-track, single-leaf structure, having a span of 160 feet from center to center of bearings, making it the longest single-leaf bridge of this type yet constructed. It is designed to carry the heaviest railroad traffic and furnishes a clear channel wide enough for the rapid passage of the largest modern lake vessels.

More than fifty other Scherzer Rolling Lift Bridges have been constructed and are in process of construction in various parts of the world for railroad, street railway and highway traffic, many of the highway bridges being of especially large span, ranging from 170 to 216 feet clear.

Among the Scherzer Rolling Lift Bridges being constructed in Europe are a combined railroad and highway bridge for the South Eastern & Chatham Railway Company across the Swale River, England, and a railroad bridge for the Fishguard & Rosslare Railways & Harbors Company across the Suir River, Ireland, The detail plans for these bridges were furnished to Sir Benjamin Baker, the distinguished engineer of the great Forth Bridge, Scotland. There is also being constructed a three-track railroad bridge for the Dutch State Railways across the Spaarne River at Haarlem, Holland, and a very long and wide highway bridge across the Ekaterinhofka River, St. Petersburg, Russia. This bridge forms the beginning of very extensive internal harbor improvements under way for the city of St. Petersburg.

The "Sane and Safe" in Travel

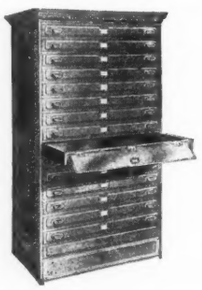
IN railway travel the most popular trains are those which afford the greatest degree of comfort and the best general service, coupled with economy of time, but the latter desideratum does not necessarily mean the train which runs at an excessive speed. The so-called "fast trains" are those which make especially good time between distant points because of the fact that they make few stops and, consequently utilize time to the best possible advantage. The "Limiteds" and "Expresses," which are the terms usually applied to "fast trains," do not run at a greater average speed than many local trains, but because they make only a few stops on their long runs they are able to cover long distances in relatively few hours. This economy of time is attained without excessive speed, and to this economy is added the highest degree of comfort and service; qualities which form an irresistible attraction to travel.

A "sane and safe" degree of speed, coupled with economy of time and luxurious service, meets the highest requirements of both the business man and the pleasure tourists, in this rapid twentieth century, when "time is money" and comfort in travel is not the exception but the rule.—*From "The World's Progress," in "Four-Track News" for October.*

Steel Furniture for Public Buildings

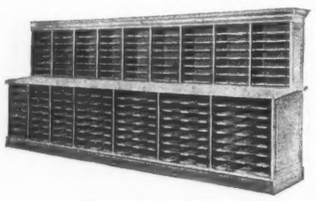
THE Berger Manufacturing Company, of Canton, Ohio, have recently received several large contracts for the production of steel equipment for public buildings in various parts of this country. Their facilities have been increased right along until now they have one of the most complete and best equipped plants in the country for the production of steel equipment and can handle the largest order with as much promptness and skill as the smallest one.

For nearly twenty years Berger productions have been known the world over for the high quality of material used and the general excellence of construction. A new steel producing plant costing half a million dollars was recently built by this company; a rolling mille owned by them rolls out the sheets used and an immense plant fashions this sheet steel into devices for the consumer.



Among the new devices for the office placed on the market by the Berger Company is the sectional steel cabinet illustrated in our advertising columns. It can be fitted with any devices desirable and is adapted to the smallest or the largest user.

The new Arcade Market at Dayton, Ohio, was recently equipped by this company with an entire outfit of steel counters, shelving, screening, etc. Other markets in various parts of the country have been and are being outfitted in the same manner.



The Berger Co. is devoting special attention to the equipment of public buildings, libraries, arcade markets and offices requiring special devices. These are suggested by the architect or builder and submission drawings are made and estimates thereof. The superiority of steel equipment over wood is being recognized more and more right along by architects everywhere and there is a special demand for this kind of furniture.

Handsomely illustrated catalogues of the regular products of the Berger Company will be sent interested persons on request, or they will send submission drawings of any special devices which may be required.

Exhibit of Rubber Products

A MOST attractive exhibit in the Manufactures Building at the World's Fair, St. Louis, is that of the B. F. Goodrich Company, of Akron, Ohio.

Here are shown samples of their various lines, embracing mechanical rubber goods (hose, belting, packing, etc.), druggists', surgeons' and stationers' rubber sundries, automobile tires, carriage tires, bicycle tires and Haskell golf balls.

In these days everybody is a user of rubber in some form or other, and the exhibit of The B. F. Goodrich Company affords an excellent opportunity to see many of the different articles made from one of Nature's most useful products.

Standard for Hydrated Lime

The manufacture of hydrated lime is a steadily growing industry, and there are now between fifteen and twenty manufacturers of this product in the United States, with a daily output of over 500 tons. A majority of hydrated lime manufacturers met at Detroit in July of this year and decided to adopt a standard for bagging and selling the product such as exists in the cement industry.

Through the courtesy of the Charles Warner Company of Wilmington, Delaware, manufacturers of "Limoid," the MUNICIPAL JOURNAL is enabled to give the following standards, which were adopted by the manufacturers of hydrated lime in the United States, and which will govern all shipments of "Limoid," taking effect September 1, 1904. The standards are as follows:

"Bags—A heavy, closely woven burlap or duck bag, containing 100 pounds, 20 bags to the ton. A paper bag containing 40 pounds, 50 bags to the ton.

"Quotations—All quotations are made including the cost of the package, no bulk uuotations being made.

"Returned sacks—The burlap or duck bags will be *repurchased* from the customer at ten cents each, when returned to the *mill* in good condition, *freight prepaid.*

"Terms of Settlement—A discount of 1 per cent. will be allowed for cash in ten days, the discount to be taken on the full price including the bag, f. o. b. manufacturer's plant or shipping point. Net cash 30 days."

Trade Publications Received

—The Manhattan Fire Alarm Company, 19 Barclay street, New York, has recently issued an attractive 20-page folder in red cover describing its auxilliary fire alarm service, and giving some other interesting matter.

—The "Book of Trains" for the month of October, issued by the Lake Shore & Michigan Southern Railway, Cleveland, Ohio, is just out and contains some attractive illustrations, as well as interesting information.

The "Four Track News," published by George H. Daniels, the general passenger agent of the New York Central Railway, now has a circulation of 100,000 per month.

—The Commercial Railway Equipment Company, 42 Broadway, New York City, now issues a monthly circular. The September number gives a partial list of locomotives, steam shovels, and calls attention to the fact that this Company has both new and second-hand equipment for railroads, mines, power plants, contractors and others.

—The C. W. Hunt Company, 45 Broadway, New York City, has just issued a 48-page catalogue, profusely illustrated, and deals with the special subject of coal-handling machinery for power stations, boiler rooms, coaling stations, gas companies, coal yards, shipping docks, manufactories, etc.

RUBBER EXHIBIT OF B. F. GOODRICH COMPANY AT WORLD'S FAIR.

Items of Interest About the Trade

—The Harper-Norton Shale Brick Company, Conneaut, Ohio, has followed the custom of issuing a calendar in the middle of the year, beginning with July. A copy can be had for the asking.

—The American Sand Lime Brick Company of Chicago has recently installed fifteen plants in various sections of the country. Some of the plants will soon be ready for operation.

—General Manager Weaver of the American Steel & Wire Company's chemical department, Chicago, Ills., recently reports that the application of sulphite of iron to the notoriously bad drinking water of Danville, Ill., has entirely overcome the difficulties in the purification of the water where other methods failed.

—For the benefit of the members of the League of American Municipalities, and the American Society of Municipal Improvements, the Cameron Septic Tank Company of Chicago calls attention to its working model, located in the Educational Building at the World's Fair. This model was described in the July issue of the MUNICIPAL JOURNAL. Mr. Wiley, general manager, will be in St. Louis at the time of the conventions to explain this system.

—The C. O. Bartlett & Snow Company, Cleveland, Ohio, has recently received orders for "Triumph steam dryers" from Lancaster and Port Clinton, Ohio; also orders for elevator machinery outfits from firms in Cleveland, Ohio, and Uniontown, Pa.

—The clients of the Commercial Railway Equipment Company havebeen notified of the purchase of that Company by the Continental Railway Equipment Company of 42 Broadway, New York City, of which Mr. George H. Hewes is general manager.

—The Vulcan Iron Works Company, Toledo, Ohio, has recently issued a chart showing the electoral votes in the United States and the total popular vote at the last national election. This company makes the celebrated "Vulcan steam shovels," also dredges, boiler fronts, fittings, etc.

Brooks Centrifugal Pumps

ONE of the exhibits at the World's Fair which is attracting a great deal of attention is that of W. H. Cook & Co., of Chicago. The exhibit consists of an attractively arranged display of Brooks Centrifugal Pumps, several types of which are shown. Thousands of visitors have been particularly attracted to this section of Machinery Hall by the claims made for the Brooks Pump by the manufacturers, who modestly yet unhesitatingly declare it is "the most efficient centrifugal pump in the world."

The makers claim that when the investigator once grasps the fact that heretofore centrifugal pumps have been constructed, in many respects, at variance with the laws or principles of operation involved, the apparently remarkable efficiency of the Brooks pump will seem reasonable.

Speaking of the merits of the Brooks pump, Mr. W. H. Cook, one of the makers, said to a representative of the MUNICIPAL JOURNAL:

"It is obvious that the volume of water flowing through any centrifugal pump is acted upon continuously by two forces—namely, by centrifugal force and by atmospheric pressure. Centrifugal force at all times acts radially and perpendicularly to the axis of rotation of the impeller. Atmospheric pressure, in the case of an axially-disposed-inlet pump, obviously tends to maintain the liquid in a straight line in continuation of the direction in which it enters the pump—in a direction parallel with the axis of the pump. The path which the liquid will actually pursue is dependent upon at least three considerations—namely, the centrifugal force acting upon it, the atmospheric pressure acting upon it, and the extent to which it is controlled, guided and deflected by the construction of the passages through the pump. Now, it would seem to require no argument to convince that the construction of the pump should be such as to permit the liquid to take that path which it naturally tends to take under the combined action of centrifugal atmospheric pressure, modified (if at all) only by considerations of *practical* construction. In other words, whatever power is consumed in deflecting and guiding the liquid out of its natural course is power consumed in impact, and is power wasted.

"It is obvious that all parts of the inflowing column of water will not be equally affected by centrifugal force. That liquid which enters at the exact center of the inlet will pass into the influence of the impelling blade at a point where the latter has practically no movement. Accordingly, there is practically no centrifugal force imparted to the column along its axial line, and the liquid might flow on indefinitely in a straight line were it not for the two considerations: first, that it is a part of a body or column of liquid which as a whole is deflected, and secondly, because the blade of the impeller has an appreciable thickness, and the liquid can therefore never enter exactly in the axis of the pump. However, it is evident that this liquid entering substantially at the axis of the pump will be deflectd radially very slowly at first, and with increasing force and abruptness as it departs from the axis and comes into the influence of the more and more rapidly moving parts of the impeller blade.

"That liquid which enters at the periphery of the inflowing column will obviously come immediately into the influence of a part of the impelling blade traveling at a relatively high speed, since it is comparatively remote from the axis of rotation. Accordingly, this peripheral portion of the column will be deflected much more abruptly and will not be long in acquiring a direction of flow substantially perpendicular or at right angles to the axis of the pump."

A Forty-Ton Garbage Crematory

THE Clinton Foundry & Machine Co. have recently been awarded a contract to build a 40-ton garbage crematory for the city of Elmira. This concern has been established fifty years and has recently completed a number of garbage crematories, including a plant now in course of construction at McKeesport, Pa. It has been the company's object to erect a plant that would be expensive to operate, and one that would not produce any odor or gases. The company has been eminently successful in doing this.

A test made on one of its contracts recently completed for the city of Charleston showed a far better result than what was anticipated, and the city were very well pleased with the plant. The company also has several other large contracts on hand.

Power Plants for Railroad Tunnels

S. PEARSON & SON, Incorporated, who are building the Pennsylvania Railroad tunnels under the East River and Long Island City, have just awarded the contract for two complete compressed air power plants, ready to operate, to the Ingersoll-Sergeant Drill Company of New York. The combined capacity of the plants consists of 50,000 cubic feet of low-pressure air per minute and 12,000 cubic feet of high-pressure air per minute.

It will be remembered that the same company recently received an order from the O'Rourke Engineering & Construction Company for the compressed air plants to be used in building the Pennsylvania tunnel under the Hudson River. The contract just awarded is the largest order ever placed in the history of the business.

These plants will be erected by the Ingersoll-Sergeant Drill Company under the personal supervision of Mr. J. H. Jowett, Sales Manager of the company.

City Not Responsible for Accidents on Blocked Sidewalks

THE Supreme Court of Illinois has decided that when a sidewalk is blocked and an accident occurs, the person blocking the sidewalk is to be held responsible for it. This decision was handed down in the case of Garibaldi et. al. versus Connor. The appellants, in conducting their business, had blocked the sidewalk, in front of their place of business, with boxes and bunches of bananas. Only a narrow space was left for the use of the public. The plaintiff having slipped and fallen on a banana was able to hold the defendants responsible, even though they had not been the means of the banana's being there.

CONTRACT NEWS FOR THE MONTH

Including Paving, Sewerage, Water Supply, Lighting, Public Buildings, Sewage and Garbage Disposal, Fire Supplies, Contracts Awarded

N. B.—All news of proposed work sent us by city officials is incorporated in our Weekly Advance News Service and appears subsequently in this "Contract News for the Month" if the date of the reception of bids be sufficiently late to warrant placing the item here.

City officials and others are urged to send us all news of contemplated improvements for use in our Weekly Bulletins which are mailed to those interested.

PAVING, PAVING MATERIALS AND MACHINERY

Akron, O.—$20,000 bonds will be issued for paving College street. Will also improve Upson street.

Albany, N. Y.—Upper Elk street will be paved with asphalt block.

Ashland, Ky.—Will readvertise for bids on the $75,000 street paving, that is to be done. R. C. Richardson, City Clerk.

Atlantic City, N. J.—An ordinance has been passed on the third reading to spend $417,142.75 on paving Atlantic avenue. $75,000 additional will be appropriated for street paving during the coming year.

Augusta, Ga.—Broad street will be paved with vitrified brick.

Baltimore, Md.—Ordinance has been passed appropriating $4,500,000 for public works. $3,000,000 will be used for new docks and widening Pratt street. $825,000 is to be used for completing Hanover, Light and Paul streets, Hopkins place, Center Market Square, West Falls avenue, Commerce and Calvert streets and $600,000 for the completion of German and Charles streets.

Beaumont, Tex.—The Supervisor of Jefferson County will sell $125,000 road bonds soon.

Bowling Green, O.—County Commissioners have sold $50,000 road improvement bonds.

Brevord, N. C.—$25,000 street improvement bonds will be sold.

Camden, N. J.—Bids wanted for asphalting Division street and paving Spruce, Jackson, Emerald and Louis streets with Belgian blocks.

Cleveland, O.—Will sell $116,000 street opening bonds. Will brick pave East Madison avenue, Jewett street, Lorain and Vine alleys, Rome court, Purdy, Hathaway, Centennial, Amos, Worley, Dolloff, Taylor, St. Clair, Seward, Hackman, Clara, Reade, Horace, Spafford, Mable, Burton, Bissell, Ottawa, Compton streets, Lodge alley, East court, Roskopt alley, Wellington, Barber, Waverley avenues and Woodward place. Will pave Lake avenue with asphalt and Superior, Mandake and Marquette streets with either Medina stone or dressed Medina block. Will pave, next summer, with brick: Lyman, Montgomery, Remington, Ranney, Phelps, China, Harriet, Clifton, Buell, Duane, Newton, Brown, Birchdale, Desmond, Dakota and Harlem streets; Branch and Rhodes avenues; Ackley court and Charles alley. Will pave Flint and Marquette streets with Medina stone. Independence and Ames avenues will be paved with common Medina stone on a 6-inch concrete base and Doan street will be asphalted. Peter Witt, City Clerk. County will raise $320,000 for improvements to roads.

Dallas, Texas—Will pave with brick Ervay street.

Detroit, Mich.—The $47,000 paving contract with the Barber Asphalt and Paving Company has been cancelled and city will readvertise for bids.

Elyria, O.—$63,950 paving bonds have been recently sold.

Etna, Pa.—Bids are wanted on 6,500 square yards of brick paving.

Hoboken, N. J.—Will repave Eighth street.

Indianapolis, Ind.—$5,000 will be spent for repairing streets.

Lawrence, Mass.—Will appropriate $15,000 for street improvements.

Leavenworth, Kan.—Will curb Arch and Cheyenne streets and pave Michigan, Pottawatomie and Fifth streets and Second avenue.

Litchfield, Ill.—City is preparing to spend $60,000 on pavement for streets. City Engineer Bates.

Lowell, Mass.—Will pave Aiken street bridge with wooden blocks at a cost of $8,500.

Meridian, Miss.—City will issue $60,000 street paving bonds and $40,000 bonds for sidewalks. Mayor Rivers.

Minneapolis, Minn.—The estimated cost of paving Kenwood Terrace is $3,485 and city will pave Eleventh avenue with 4-inch creosoted wood blocks on a 6-inch concrete base. Marshall street will be paved with vitrified brick. City will spend $399,186, next year, for sewers, pavements, curbs and gutters, of which $51,000 will be spent on new paving and $15,000 on repairs to pavements.

Montgomery, Ala.—$12,500 bonds will be issued for improvements to streets.

New York City, N. Y.—Park Row will be repaved with asphalt.

Petersburg, Va.—Ordinance has been introduced to issue $150,000 bonds for street improvements. Washington, Sycamore, Franklin, Bank and High streets will be asphalted at a cost of $75,000.

Rochester, N. Y.—Will pave University avenue, Albemarle and Rosedale streets and lay cement walks in Rodenbeck place, Coleman and Norton streets. $13,500 will be spent on resurfacing William street; $9,200 on paving Phelps avenue and $5,000 on paving Brozel street.

St. Joseph, Mo.—Will pave Fourteenth and Patee streets with vitrified brick and asphalt part of Jule street.

St. Paul, Minn.—Estimated cost of asphalting College avenue is $22,710.

Seattle, Washington—Will pave Cherry street with sandstone blocks, at an estimated cost of $2,900. Will lay concrete walks on Crockett street, Belmont place, Thirteenth and Fifth avenues at an estimated cost of $33,150. Also on Irving street, at $3,260 and East Lynn street, at $2,300.

Springfield, Ill.—The cost of paving Ninth street, from Madison street to North Grand avenue, has been estimated at $36,645.

Thamesville, Ont.—Will spend $6,500 on granolithic sidewalks.

Toledo, O.—$20,345 paving bonds and $73,000 repaving bonds will be sold. Jackson street will be repaved with either vitrified paving blocks, asphalt blocks, sheet asphalt, Medina blocks, or creosoted wood blocks laid on a foundation of concrete or one of the several kinds of block on a sand base. Will repave Potter, Clark, Fifteenth and Machen streets in the same manner.

Toledo, O.—$20,345 paving and $73,000 repairing bonds will be sold.

Trenton, N. J.—Monmouth street will be paved with sheet asphaltum on a 4-inch concrete base. Harry B. Salters, City Clerk.

Upper Sandusky, O.—$10,086 is City Engineer Gear's estimate for paving Johnson street with brick from Chief east to Eighth streets.

West Bay City, Mich.—Tenth street will be paved with brick and asphalt.

West Palm Beach, Fla.—$9,000 bonds have been voted for improving the streets.

Youngstown, O.—Will pave the park at Wilson and Himrod avenues.

Contracts Awarded

Beverly, Mass.—Contract for reconstruction of streets to Antonio Tomasello, Leverett street, Boston, at $22,244.

Birmingham, Ala.—Contract for paving Eighteenth street and Morris avenue with vitrified brick to Crockett Paving Company, at $63,484.50.

Centerville, Ia.—Contract for brick paving to McCartney Construction Company for 20,000 square yards, at $2.00 per square yard, and 3,000 feet of curbing, at 45 cents per foot.

Chicago, Ill.—Contracts to R. T. Conway Company for: Asphalt paving Blackhawk street, $26,692; California avenue, $61,427; Camp-

bell avenue, $15,345; Garfield avenue, $27,256; Chicago avenue, $25,093; State street, $34,000. Contracts to Citizens' Construction Company: Commercial avenue, brick, $28,858; Waldo place, granite, $10,279; West 12th street, asphalt, $19,911. Contract to M. M. McGovern, for West Fifty-seventh street, macadam, at $20,150. Barber asphalt Company awarded contract for paving Wilcox avenue with asphalt, $22,968, and Erie street, asphalt, $72,852. Contracts to Standard Paving Company for Carroll avenue, asphalt, $11,866, and West Lake street, at $62,035.

Cincinnati, O.—Contract for paving Main and Walnut streets with asphalt to Blake Asphalt Maintenance Company, at $16,962 and $14,713 respectively.

Columbus, Ind.—Contract to Barber Asphalt Paving Company for 8,310 square yards asphalt at $16,955, and 3,920 square yards brick at $9,544. Contract for paving Town street to D. E. Sullivan and Son, at $17,700.

Dowagiac, Mich.—Contract for paving Beeson, Front and Commercial streets with Metropolitan brick to T. M. Kemp & Son, Middletown, O., at $24,128.

Economy, Pa.—Contract for grading, curbing and paving with vitrified brick to Sweeney & Company, Pittsburg, at $43,000.

Elizabeth, N. J.—Contract for 1,800 square yards of oblong pavement, 810 lineal feet reset curb and 140 lineal feet new curb to J. J. Potts, at $6,399.

Kansas City, Mo.—Contract for paving six streets to Barber Asphalt Paving Company, at $29,804.

Lincoln, Ill.—Contract for paving to John F. Bretz & Son, Springfield, at $50,000.

Mankato, Minn.—Contract for 35,000 square yards of paving to McCarthy Improvement Company, Davenport, Iowa, at $100,000.

Oakland, Cal.—Contract for scenic foothills road, High street, to Haywards, Ransome Construction Company, at $300,000.

Oelwein, Iowa—Contract for 35,000 yards of brick paving to M. Ford, Cedar Rapids, at $1.99 per yard.

Pasadena, Cal.—Contract for improving Pico street to Fairchilds-Gilmore-Wilton Company, at $68,550.

Paxton, Ill.—Contract for street paving to H. & G. Turner, at $10,500.

Peoria, Ill.—Contract for paving Oak street to A. D. Thompson, at $8,366.61.

Pittsburg, Pa.—County Commissioners let contracts for 3 miles of Logan Ferry road to J. C. McSpadden, at $36,445; Brownville road, 4½ milee, at $49,901, and West View road, 2 miles, to Booth & Flinn, at $18,289.

Philadelphia, Pa.—Contract for extension of Torresdale Boulevard to Daniel J. McNichol, at $500,000.

Pine Bluff, Ark.—Contract for paving several streets with vitrified brick to I. P. Shelby, at $57,000.

Richmond, Ind.—Contract for brick pavement on Ft. Wayne avenue to J. F. Cronin, 105 North 16th street, at $9,879.

St. Paul, Minn.—Contracts for paving Third street with sandstone to Fielding & Shepley, 217 West University avenue, at $18,139. Contract for paving Bates avenue with asphalt to Barber Asphalt Paving Company, at $25,209.09.

Salt Lake City, Utah—Contract for paving First street to P. J. Moran, at $17,361.

Sandusky, O.—Contract for asphalt block pavement to C. H. Burchinal, Toledo, at $75,000.

San Francisco, Cal.—Contract for paving "H" street with asphalt to F. M. Yorke, at $29,150.

Seattle, Wash.—Contract for road to Rainier National Park, Wash., to A. D. Miller, City, at $25,648. Contract for paving Pine street and Second avenue with asphalt, at $19,434, Boyleston avenue and Marion street, at $7,858, and Spring street, at $14,789, to Barber Asphalt Paving Company. Maintenance is, on Pine street and Second avenue contract, 3 cents per yard; on Boyleston avenue and Marion street contract, 2 4-5 cents a yard, and Spring street contract, 2 4-5 cents per yard, all for 10 years.

Springfield, Ill.—Contract for 12,300 square yards of paving on Douglas avenue and 6,900 lineal feet of curbing on same to J. E. Bretz, at $17,650 and $3,588 respectively.

Tacoma, Wash.—Contracts for cement walks on "G" street and Tacoma avenue, at $22,870, and also on Division avenue and "I" street, at $23,970, to McHugh and Kibler, Seattle.

Wellsville, N. Y.—Contract for paving with brick on Genesee, Pearl and State streets to Halfrich & Company, Olean, N. Y., at $14,218.

PUBLIC BUILDINGS

Aurora, Ill.—$63,000 high school bonds have been voted.

Baltimore, Md.—Having plans prepared for the Eastern high school which will cost $250,000 anyway and may cost $400,000. Plans have been approved for alteration on court-house to the amount of $150,000. It has been reported that the market house at Water street and Market place will be rebuilt at a cost of $125,000.

Birmingham, Ala.—General plans have been adopted for a high school building and will advertise for plans and specifications for construction.

Brooklyn, N. Y.—Plans have been filed for the erection of a three story, brick, police station to be located at Lawrence avenue and Third street.

Buffalo, N. Y.—$150,000 bonds will be issued for the erection of school buildings in Central Park and South Buffalo.

Cheltenham, Pa.—The Commissioners of Cheltenham township are having plans prepared for a $50,000 high school.

Chicago, Ill.—Will erect two municipal buildings to cost $120,000; one to be erected at Park avenue and 111th street and the other in the park at 83rd street and Bond avenue. South Park Commissioners. Plans have been prepared for a $150,000 school building for the Englewood district.

Cincinnati, O.—The Board of Education has divided the sale of bonds for school buildings as follows: Clifton, $35,000; Evanston, $60,000, and Lickrun, $60,000. Will also alter 10th district school building to the amount of $40,000.

Columbus, O.—City expects to spend $25,000 for North Side market improvements.

Cordele, Ga.—Plans have been prepared for a new city hall.

Decatur, Ala.—Will erect a $30,000 brick or stone school building.

Duluth, Minn.—Contract for $50,000 school building will soon be let.

East Cleveland, O.—Bids are wanted on October 6 for a high school building.

Elgin, Ill.—City is having plans prepared for a $120,000 high school building.

Fergus Falls, Minn.—$45,000 bonds have been voted for a high school.

Grand Rapids, Mich.—Board of Education is considering issuing $200,000 bonds for schools.

Jackson, Miss.—Hinds County will erect an $80,000 courthouse.

Jersey City, N. J.—$65,000 courthouse bonds have been sold.

Jonesville, Va.—$10,000 for a jail has been appropriated by the Board of Supervisors of Lee County.

La Crosse, Wis.—Plans are being prepared for a $100,000 high school building.

Lebanon, Va.—County Commissioners will erect a $20,000 jail.

Locust Grove, Ga.—Plans are being prepared for $25,000 school building.

Louisville, Ky.—City is having plans prepared for the erection of an armory.

Lowell, Mass.—Will borrow $40,000 for brick school building to be erected on Ennell street, Centralville. Board of Aldermen.

Milwaukee, Wis.—Plans have been approved for a $130,000 high school for the North Side.

Newman, Ga.—Plans are being prepared for an $80,000 courthouse.

Philadelphia, Pa.—Plans are being prepared for a $320,000 manual training school at Broad and Jackson streets; also for a $350,000 commercial high school for girls at Broad and Green streets. Plans will be prepared for the following school buildings: 11th ward, $50,000; 6th ward, $65,000; 7th ward, $60,000; Eleventh and Venango streets, $60,000; Belmont avenue and Monument road, $20,000;

Third and Christian streets, $60,000; 24th ward, $55,000; 18th ward, $50,000; Third and Pine streets, $40,000; Wharton and Sheridan streets, $25,000; 15th ward, $9,000; Oak Lane, $50,000; Phaun and Decatur streets, $45,000; Front and Wolf streets, $70,000; Emerald and Orleans streets, $70,000; Twenty-eighth and Diamond streets, $60,000; Fifty-seventh and Spruce streets, $70,000.

Pittsburg, Pa.—Plans are being prepared for a $50,000 brick school building for the 23rd ward.

Regina, Assa., Can.—A $61,000 government post office will be erected.

Salem, Mass.—Competitive plans will be made for the erection of a $200,000 high school building.

Seward, Neb.—Seward County will vote on November 8, on the issuance of $100,000 courthouse and jail bonds.

Shreveport, La.—Will vote on issuing $100,000 bonds for the erection of a new city hall.

Somerset, Pa.—Bids for the erection of the Somerset County courthouse may be readvertised as all bids exceeded estimate by $50,000.

Titusville, Pa.—Will vote on November 8, on bond issue for the erection of a $75,000 high school building.

Toronto, Can.—The Riverside school will be erected at a cost of $55,000.

Vancouver, B. C.—Will erect a new post office building to cost $300,000.

Woonsocket, R. I.—Sanborn County will vote November 8 on issuing $30,000 courthouse bonds.

Contracts Awarded

Alba, Tex.—Contract for erection of courthouse to Wood County Investment Company, at $60,000.

Alva, Okla. Ter.—Contract for Wood County courthouse to F. G. Bonfils, Denver, Colo., at about $60,000.

Bayonne, N. J.—Reported to have awarded contract for police headquarters to Church Construction Company, New York City, at $51,850.

Bloomfield, Ill.—Contract for Irving school to John W. Evans Sons' Company, at $43,598.

Brooklyn, N. Y.—Contract for construction of addition to school 103, Brooklyn, to John Aver & Sons, 957 Broadway, at $167,500.

Chicago, Ill.—Contract for Field House 3, Thirty-third street and Fifth avenue, to Rudolph S. Blome Co., Unity Building, at $90,000.

Chico, Cal.—Reported to have let contract for high school building to W. W. Anderson, San Francisco, at $26,697.

Davenport, Iowa—Contract for high school building to H. B. Walters, Danville, Ill., at $191,270.

Eureka, Cal.—Contract for municipal building to Wilson Lyon Construction Company, San Francisco, at $71,216.

Fargo, N. D.—Contract for Cass County courthouse to Johnson & Powers, at $92,500.

Galesburg, Ill.—Contract for high school building to Davidson & Rundquist, at $95,000.

Henry, Ill.—Board of Supervisors let contract for jail to Pauly Jail Company, St. Louis, Mo., at $18,955.

Lancaster, O.—Reported to have let contract for high school building to W. W. & E. E. Bohe, Thurston, O., at $42,698.

Marlboro, Mass.—Contract for city hall building to I. M. Hurley & Company, at $82,000.

Natchitoches, La.—Contract for jail to Pauly Jail Company, St. Louis, Mo., at $32,500.

New Bedford, Mass.—Contract for school building to H. A. Miller, at $68,439; contract for 12-room school building to J. B. Sullivan, at $51,900.

Oklahoma City, Okla. Ter.—Contract for courthouse to Gross Construction Company, at $100,000.

St. Louis, Mo.—Contract for State School for Blind to Frinn & Colnon, Laclede Building, at $100,000.

Somerset, Pa.—Reported that contract for courthouse has been let to Caldwell & Drake, Columbus, Indiana, at $247,444.

Sullivan, Ill.—Contract for courthouse to H. B. Walters, Danville, Ill., at $67,952.

SEWERS

Aberdeen, Miss.—On October 5, bonds for a sewerage system will be sold.

Akron, O.—Will extend sewerage system on Long, Charles, Otis, South and Furnace streets.

Albany, N. Y.—Sewer system will be extended on Upper Elk, Third, Lancaster and Quail streets.

Allegheny, Pa.—Will sewer Bayard, Rhine, Brente, Polar and Suffolk streets.

Alliance, O.—Plans have been prepared for the installation of $20,000 worth of sewers.

Binghamton, N. Y.—City expects to build an $85,000 trunk sewer in the near future.

Camden, N. J.—Will sewer Tenth and Federal streets.

Cincinnati, O.—Will sewer Ravine street: 1,790 lineal feet of 12-inch pipe; 380 lineal feet, 18-inch pipe; 365 lineal feet, 21-inch pipe; 11 Palmer inlets, 2 round manholes, 16 oval manholes; 75 12-inch, 20 18-inch, and 20 21-inch "Y" branches. Also will sewer Guy street: 605 lineal feet of 12-inch pipe; 3 Palmer inlets; 2 round and 2 oval manholes; 35 12-inch "Y" branches.

Cleveland, O.—Will extend sewers on Brighton, Hosmer, Fullerton, Schade, Sargent, Rouse, Prague, Cannon, Fairbanks, Lynn, Quimby, Catharina, Dearborn, House, Leopold, Consul, Schiller, King, Rutledge and Hiesley streets, and Schley, Ambleside, Skinner, Third, Lee, East Madison, Brinsmade, Franklin and Auburndale avenues.

Covington, Ky.—Will issue $50,000 sewer improvement bonds.

Dayton, O.—City will sell $20,000 storm water sewer construction bonds. Will lay sewer extensions in sewer districts 6 and 7 and bids are wanted for sewers to be laid on Fifth and Howard streets.

Dublin, Ga.—Will vote on October 10 on the issuance of bonds for extending the sewer system.

East St. Louis, Ill.—$60,000 has been appropriated for the construction of a large outlet sewer.

Grand Rapids, Mich.—Sewerage system will be extended on Morris and Oakdale avenues. Considering sewer extensions on the following streets: Church street, $790; Milton avenue, $500; Marion street, $582; Court alley, $327; South Ionia street, $344; Earldom street, $411; North Union street, $344; Garden street, $441, and Ellsworth avenue, $427. John L. Boer, City Clerk.

Hopkinsville, Ky.—Will vote in November on the issuance of $50,000 sewerage system bonds. Septic tank system is being considered.

Jacksonville, Ill.—City is considering three plans for the construction of a trunk sewer: $153,700; $165,700 and $192,400.

Lancaster, Penna.—City has sold $250,000 bonds for improvements to sewers.

Lexington, Ky.—Will vote on November 8 on the issuance of $100,000 sewer bonds.

Mamaroneck, N. Y.—$200,000 have been voted for sewer system.

Marquette, Mich.—Considering the installation of a 10,000 foot trunk sewer, to cost $25,000.

Minneapolis, Minn.—Will spend $399,186 next year for sewers, pavements, curbs and gutters, of which $49,500 will be spent for new sewers and $40,000 for repairing old ones. Will also sewer Twenty-sixth avenue in 1905, at a cost of $11,000.

Nashville, Tenn.—The Retail Merchants' Association is endeavoring to have the city issue $1,000,000 for sewer and water main extensions.

Naugatuck, Conn.—Bids wanted for sewer extension on Pond, High and Maple streets and plans will be drawn for sanitary sewer on Main street.

Newark, N. J.—Will enlarge and rebuild brick sewer on Fourteenth street and Central avenue, with brick sewers on Gould, Ninth and Central avenues and pipe sewers on South Fifteenth street.

New Orleans, La.—Bids wanted on November 9 for four 20,000-000-gallon pumping engines, working against 218-foot head; three 40,000,000-gallon centrifugal pumps, 25-foot head; three engines, two 150-kilowatt 550-volt D. C. generators; two engines, six 400 horsepower water-tube boilers. Sewerage Water Board.

Niagara Falls, N. Y.—Will construct tunnel sewer from Cleveland

avenue and Tenth street to river at an estimated cost of $35,000.

Oakland, Cal.—Will sewer Twenty-fifth street in near future.

Oklahoma City, O. T.—Will vote November 8 on sewer bond issue.

Omaha, Neb.—It is reported that the city will build sewers to the amount of $80,000 this fall.

Passaic, N. J.—Will extend sewer system on Main and Barbour avenues. Thomas T. Watson, City Clerk.

St. Joseph, Mo.—Will construct a 22-inch sewer in district 82, 22- and 24-inch vitrified pipe, 2 manholes and 4 inlets; a sewer in district 83, 15-inch, 21- and 22-inch vitrified pipe, 4 manholes and 11 inlets; a sewer in district 33, 12- and 15-inch vitrified pipe, 1 manhole and 5 inlets; a sewer in district 85, 21- and 24-inch vitrified pipe, 2 manholes and 4 inlets. It is reported that the following appropriations, for sewer extensions, have have been made: Blakesnake, $60,000; Mitchell avenue, $60,000; main sewer in South St. Joseph, $75,000; Sycamore street, $18,000; Grand avenue main, $30,000; Wyatt Park main, $10,000, and $2,500 for other sewer work.

St. Louis, Mo.—Bill has been passed by House of Delegates to appropriate $2,000,000 for sewer extensions and land for same.

St. Paul, Minn.—City Engineer has prepared estimates for the cost of sewer extensions on Juno street and Conway street at $5,034 and $1,100, respectively.

Sebring, O.—City has passed resolution for a sanitary sewer system and disposal work, to cost $47,000, it is reported.

South Brooklyn, O.—Will sell on October 10 $25,000 sewer bonds.

Steubenville, O.—It is reported that city will spend $40,000 on sewer extensions.

Toledo, O.—Will construct sewer 927 in main district 20, sewer 929 in district 34, sewer 928 in district 16, sewer 925 in district 18, sewer 934 in district 22, and sewer 926 in district 18. Will sell $21,200 sewer bonds. Bids wanted for the construction of sewer extension on Madison avenue.

Topeka, Kan.—City Engineer McCabe estimates Fifth Ward sewer at $66,752.63: 11,045 lineal feet of 8-inch; 3,075 lineal feet, 10-inch; 4,769 lineal feet, 12-inch; 3,221 lineal feet, 15-inch; 773 lineal feet, 18-inch; 1,872 lineal feet, 21-inch; 653 lineal feet, 24-inch, and 706 lineal feet, 27-inch sewer pipe; 500 lineal feet, 30-inch pipe or brick; 215 lineal feet 36-inch brick or concrete; 3,332 lineal feet, 45-inch (2-ring) brick or concrete; 115 lineal feet, 45-inch (3-ring) brick or concrete; 75 manholes; 45 catchbasins; 21 inlets; 3 flushing tanks; 800 lineal feet galvanized iron pipe, concrete, stone, etc. Estimated cost of Second Ward sewer is $136,385, and will issue bonds for it together with bonds for Fifth Ward and Sixth Ward sewer, which is estimated at $70,960.

Trenton, N. J.—Will extend sewers on Monmouth street, Whittaker, Golden and Princeton avenues and Daywood street.

Waterloo, N. Y.—Will issue bonds for a $56,000 sewer system.

Weatherford, Tex.—Voted recently on the issuance of $25,000 sewerage system bonds.

Contracts Awarded

Bay City, Mich.—Contract for 26 by 39-inch egg-shaped sewer, on Park avenue, to R. Donohoe & Company, at $9,787.

Boise City, Idaho—Contract for main sewerage system, to James Kennedy, Fargo, N. D., at $114,965.

Buffalo, N. Y.—Contract for Chelsea Place sewer, to Johnson & Mumm, 548 Perry street, at $2,492.

Canton, O.—Contract for 15¾ miles of sewer extensions, let as follows: Sewer district 2, to Ott Brothers, Pittsburg, Pa., at $50,521.56; East Tuscarawas street, to Turnbull & Son, at $199.225.

Cincinnati, O.—Contract for Clifton avenue sewer to McCarthy Brothers, 545 Dandridge street, at $21,896.

Columbus, O.—Contracts for intercepting sewer extension, to Westwater & Casey, at $116,200.

Dansville, N. Y.—Contract for sewer system, to Eveline & Baltimore, Corning, N. Y., at $78,000.

Dayton, O.—Contract to William Hill, for sewer construction, as follows: Storm sewer in St. Paul avenue extension, $4,254.25; Ridge and Fountain avenues, $738; Ford street, $1,131.65; Cross street, $493.25; Alberta street, $2,879; Jay street, $467.90.

Detroit, Mich.—Contracts for sewers on Orleans street and Mack avenue, to John Jeynes, 399 Avery avenue, t $11,091; sewers on Iroquois and Chippewa avenues, to Julius A. Porath, at $10,453.

Gloversville, N. Y.—Contract for $13,500 trunk sewer, to Albert M. Banker.

Laurel, Miss.—Contract for sewer system, to C. M. Rubush, Meridian, Miss., at $13,995.15.

Lewiston, Pa.—Contract for sewers for entire city, to International Construction Company, Pittsburg, at $97,868.

Milbank, S. Dak.—Contract for sewers in district 1, to Sioux Falls Construction Company, Sioux Falls, S. D., at $12,267.

LIGHTING

Baltimore, Md.—Plans are being prepared for a $150,000 municipal electric lighting, heating and power plant to be established in wharf district.

Bay City, Mich.—City will buy 12 electric light meters and 300 light transformers.

Camden, N. J.—An electric light plant will be installed at Morris station water works.

Clifton Springs, N. Y.—It has been recently voted to erect an electric light plant.

Clinton, S. C.—Have voted $25,000 bonds for the erection of an electric light plant and water works.

Douglas, Ga.—Contract will be awarded shortly for $20,000 light and water system.

Elkhart, Ind.—The gas plant will be enlarged to the extent of $50,000.

Front Royal, Va.—City has secured an engineer to draw up plans for an $18,000 electric light plant.

Grass Valley, Ore.—Will buy and enlarge local electric light plant.

Gainesville, Ga.—Will install 50 new electric arc lamps.

Jacksonville, Tex.—Considering the installation of an electric light plant.

Kingston, Ont.—Will spend $7,700 on repairs to electric light plant, just acquired.

Kissimee, Fla.—Bids are wanted for an electric light plant, estimated to cost $19,000.

New Albany, Miss.—Plans are being prepared for a municipal electric light plant.

Newport, Ky.—May vote on November 8 on bond issue for $90,000 municipal electric light plant. City Clerk.

New York City, N. Y.—Will issue $140,000 special bonds for lighting public schools.

Paducah, Ky.—Considering the improvement and enlargement of the electric light plant.

Vacaville, Cal.—Consulting engineer will be engaged to approve plans for a municipal electric light plant.

Contracts Awarded

Burlington, Ia.—Contract for municipal electric light plant, to Bellman and Sandford, 149 Broadway, New York City, N. Y., at $26,860.

Hull, Que., Can.—Contract for electric light plant to E. Bisson, at $13,670; laying water pipe awarded to Leon Bertrand, at $2,671; completing present pump house to J. C. Clouthier, at $2,395.

Kalamazoo, Mich.—Reported to have awarded contracts for improvements to municipal lighting plant to: Arbuckle, Ryan and Company, Toledo, O., one 400 horse-power engine, boiler condenser and shafting; Fort Wayne Electrical Works, 90-light dynamos, switchboards, 300 enclosed arc lamps and new piping. Total cost, $20,661.

Philadelphia, Pa.—Contract for power house at municipal hospital, to Henderson and Company, at $103,000.

Thomson, Ga.—Contract for electric light plant, to Electrical Supply Company, Savannah, at $7,586.

Wilburton, I. T.—City has signed contract with James Degnan for $50,000 electric light plant.

WATER SUPPLY

Abbeville, La.—Considering the erection of a $40,000 water works.

Augusta, Me.—Surveys are being made for a new water supply.

Bordentown, N. J.—City will erect a water works at an estimated cost of $85,000.

Boyce, La.—Will install a water system at an estimated cost of $14,000. I. W. Sylvester, Alexandria, La.

Clarion, Iowa.—Voted to issue $15,000 bonds for water works.

Clear Lake, S. D.—Will sell $9,000 water works bonds.

Cleveland, O.—Cleveland Heights have voted to issue $50,000 water works bonds. C. F. Schultz, First Assistant Engineer of Water Works Department, has made an estimate for a high pressure fire service main in downtown districts, to cost $300,000; 179 hydrants, 43,350 feet of 8, 10 and 16-inch water pipe. For station at Kirtland: 4 new, 2,500 gallons per minute and 1 new, 1,000 gallons per minute, pumps; and 300 horse-power boilers.

Clinton, S. C.—$25,000 bonds have been issued for water and electric light plants.

Colfax, Wash.—Considering the laying of 13 miles of 7½-inch pipe, to springs near Elberton, at an estimated cost of $40,000.

Covington, O.—Contract will be awarded on October 12 for the $30,000 water works.

Danville, Va.—Considering the erection of a $75,000 filter plant. Bids will be asked, soon, for the erection of pumping station on Dan river, estimated at $100,000.

Dayton, O.—Having plans drawn up for the erection of a new pumping station.

Depere, Wis.—It has been voted to buy local water system at a cost of $27,300 and erect a pumping station to cost $45,000.

Dublin, Ga.—Will vote on October 10 on issuing bonds for the extension of water mains.

Elyria, O.—Board of Public Service has requested $50,000 for the installation of a new pump at water station.

Fort Wayne, Ind.—City will increase its water supply.

Franklin, Neb.—City has had surveys drawn up for a water works system estimated at $20,000.

Geary, O. T.—It is reported that $52,000 bond have been sold, for the construction of a water works system.

Glasgow, Mont.—It has been recently voted to issue $20,000 water supply bonds.

Hardwick, Vt.—$15,000 have been voted to increase water supply.

Heber, Utah—Bids are wanted for the construction of a water works system estimated at $10,000. City Recorder.

Kansas City, Mo.—Bids are wanted for three new pumping engines. A 20-inch high pressure water main will be laid into west bottoms.

Lebanon, Pa.—May vote on November 8 on an additional supply pipe line.

Macon, Ga.—Considering the erection of a municipal water works plant instead of buying the local one.

Madisonville, Ky.—Will vote on November 8 on municipal ownership of water works.

Magnolia, Miss.—Will want bids soon for water works system.

Mangum, O. T.—Wells are being sunk preparatory to the erection of a water works, estimated at $30,000.

Marshall, Minn.—Report is being prepared on improvements to water works.

Maumee, O.—Bids are wanted October 10, for the construction and operation of water works and 41,000 feet of from 4-inch to 10-inch mains.

Medina, N. Y.—Considering the erection of a municipal water works.

Menasha, Wis.—Will have plans drawn for a water works system estimated at $50,000.

Milbank, S. D.—Plans have been prepared for a water works system.

Minden, La.—City will issue $46,000 water works bonds on October 17.

Minneapolis, Minn.—Will vote on the erection of a sand filtration plant, estimated to cost $1,270,000.

(Continued on page 27.)

ENGINEERS, CONTRACTORS, Etc.

ENGAGED IN MUNICIPAL WORK

IOWA ENGINEERING COMPANY
CIVIL, HYDRAULIC AND SANITARY ENGINEERS
Chas. P. Chase, Pres. and Manager Arthur J. Cox, Sec. and Treas.
410-411 Weston Block, CLINTON, IA.
Specialties: Water-Works, Sewerage and Sewage Disposal

Emil Kuichling, C. E.
CONSULTING ENGINEER
52 Broadway, NEW YORK
Member of Am. S. C. E.
Plans for Public Water Supplies, Steam and Hydraulic Powers and Electric Power Transmissions.

CITY-WASTES DISPOSAL CO.
156 Fifth Avenue
NEW YORK
(Organized from the Staff of the late Col. George E. Waring, Jr.)
Consulting and Contracting in Sewerage, Sewage Disposal, Garbage and Refuse Disposal and Street Cleaning.

WISE & WATSON
CIVIL AND CONSULTING ENGINEERS
Passaic National Bank Building
PASSAIC, N. J.
Colin R. Wise,
City Surveyor of Passaic, N. J.
Robert M. Watson,
Borough Engineer of Rutherford, N. J.

J. T. FANNING
CONSULTING ENGINEER
300 Hennepin Avenue
MINNEAPOLIS, MINN.
M. Am. Soc. C. E.
Plans for Public Water Supplies, Steam and Hydraulic Powers and Electric Power Transmissions.

Water Analysis and Methods of Filtration
JAMES M. CAIRD
Office and Laboratory: **271 River Street, TROY, N. Y.**

The Municipal Engineering Company
(Incorporated)
Wall Street Exchange Building
41-43 WALL STREET, N. Y. CITY
Civil, Hydraulic, Sanitary and Electrical Engineers, Consulting, Designing Supervising and Contracting
SPECIALTIES
Water-Power Developments
Water Supply
Pumps and Pumping Plants
Irrigation Works
Heavy Masonry
Sewage Disposal
Garbage and Refuse Cremation

Rudolph Hering
AND
George W. Fuller
HYDRAULIC ENGINEERS AND SANITARY EXPERTS
170 Broadway, NEW YORK
Water Supply, Water Purification, Water-Power, Sewerage and Sewage Disposal. Examinations of Projects, Plans, Specifications and Estimates of Cost.
Construction Superintended

Mt. Healthy, O.—Board of Elections has been petitioned for a special election to vote on $25,000 bond issue for new water works.

Muscatine, Ga.—Considering the erection of a pumping station to be placed on Muscatine Island at an estimated cost of $85,000.

Nashville, Tenn.—Retail Merchants' Association has requested city to issue $1,000,000 bonds for water main and sewer system extensions.

Nevada, Mo.—Will sell on October 4, 90,000 bonds for municipal water works. S. L. Higgins, City Clerk.

New Albany, Miss.—Plans are being prepared for municipal water works.

New Castle, Neb.—$6,500 bonds have been voted for water works.

New London, Ont.—Plans are being prepared for a water works system.

New Orleans, La.—Bids are wanted for 8,000 to 10,000 tons of cast iron pipe. Sewerage and Water Board.

Newton, Miss.—Will issue $10,000 water works bonds.

North Bay, Ont.—It is reported that $35,000 will be spent on city water works system.

North Fort Worth, Tex.—Bonds have been voted and engineer has been retained for installation of proposed water system of $100,000.

Ocean City, N. J.—It is reported that citizens have subscribed $60,000 toward installation of water works.

Oklahoma City, O. T.—Will vote on November 8 on the issuance of water works bonds.

Parker's Prairie, Minn.—Voted $8,000 bonds for water works.

Philadelphia, Pa.—Bids will be called, soon, for preliminary filter plant.

Pittsburg, Pa.—Mayor has signed $5,000,000 bond issue ordinance for filtration.

Reading Pa.—$30,000 will be spent in order to complete Antietam filter plant. City Clerk.

St. John, N. B.—It is reported that two steel aqueducts will be constructed, 10,000 feet of 33-inch wood stove pipe and 15,000 feet of 39 by 48-inch drain pipe will be used at a cost of $175,000.

Schoharie, N. Y.—Voted $30,000 bonds for water works.

Seattle, Wash.—Will lay water mains on Twentieth avenue, north, North Tenth avenue and Evanston avenue at a cost of $28,370. Will lay water mains on Sunnyside, Corliss and North Twenty-first avenues at a cost of $11,680.

Springfield, Mass.—Mayor has signed ordinance to erect Dudlow filter plant, which will be constructed next year.

Vancouver, B. C.—Will vote soon on issuing $100,000 bonds for water works extension and improvement.

Wellsville, O.—$16,000 water works bonds have been recently sold for improvements.

Wilmington, Del.—Bids wanted for water works system: 21,000,000-gallon basin, 6 filter beds, pumping station, 2,200 feet of 72-inch concrete conduit; 9,300 feet 66-inch, 4,950 feet of 66-inch (in tunnel) concrete conduit, 4,370 feet of 48-inch iron or steel pipe, intake crib and gate house, two 16,000,000-gallon centrifugal pumps and engines, two 200 horse-power boilers and other machinery; 2,500 tons of cast iron pipe and specials and alternate bid on 3,800 feet of 49-inch riveted steel pipe; 88 gate valves and special valves, 6-inch to 48-inch; 10,000,000-gallon clear water reservoir; 1 custodis stack, 125 feet high.

Contracts Awarded, Water

Asheville, N. C.—Contract for French Broad pipe line to Kelly and Felthaus, at $3,197.

Attleboro, Mass.—Contract for concrete steel standpipe to Aberthaw Construction Company, at $34,365.

Brockton, Mass.—Contract for standpipe to Reeves Brothers, Alliance, O., at $10,325.

Chetek, Wis.—Contract for water works to W. I. Grey and Company, Minneapolis, Minn., at $6,736.

Colman, S. D.—Contract for compressed air water works system to National Construction Company, South Bend, Ind., at $8,000.

Columbus, O.—Contract for cast iron pipe across Scioto River to Westwater and Casey, at $116,279.

(Continued on page 28.)

Hudson Engineering & Contracting Co.
92 William Street
New York

Bacon Patent Simple and Compound Air Lift Systems
Water Works and Artesian Well Systems Designed and Installed.

JOHN W. ALVORD
CONSULTING ENGINEER
1207 Hartford Bldg., CHICAGO

MEM. AM. SOC. C. E.
Hydraulics and Sanitation Works. Water Supplies, Water Power, Sewerage, Sewage Disposal.

STEPHEN CHILD
LANDSCAPE ARCHITECT
AND
CONSULTING ENGINEER
Warren Building, 2a Park St.
BOSTON, MASS.

S. B. Massachusetts Institute of Technology, 1888.
Member American Society of Civil Engineers.
Telephone Connection
Correspondence Solicited.

THOMAS HAWKES
LANDSCAPE ARCHITECT
1532 Monadnock Block
CHICAGO

Designs Prepared for Parks, Cemeteries, Private Estates, Subdivisions, &c.
Correspondence Solicited
Tel., Harrison 3652

O. H. SHEFFIELD & CO.
CIVIL ENGINEERS AND ARCHITECTS
518 Austell Building, ATLANTA, GA.

Railways
Water-Powers
Municipal Public Works
Bridges and Buildings

ELISHA GREGORY
CONTRACTOR FOR DRILLING ARTESIAN WELLS
123 Liberty Street, NEW YORK

WILLIAM B. EWING
CIVIL AND CONSULTING ENGINEER
1003 Chamber of Commerce
CHICAGO, ILL.

MEM. AM. S. C. E. MEM. WEST. S. E.
For Hydraulic, Sanitary, and Municipal Works. Water Works, Sewerage Systems, Septic Tanks, Sewerage Purification, Water Power, Pavements, Bridges, Expert Concrete Construction, Expert Examinations and Reports.

J. W. HOWARD, C. E.,
1 Broadway, New York
In person or by mail. 23 years experience.
Full equipped laboratory.

Information, Inspection, Reports,
Asphalt and other Pavements
Paving materials, Machinery, Men, Companies, Specifications, Formulae, Analyses, Litigation.

William S. Barstow
CONSULTING ELECTRICAL ENGINEER
56-58 Pine Street
NEW YORK
Western Office
The "Portland," Portland, Oregon

Examinations and Reports on Electrical Properties
Estimates, Specifications and Plans for Electric Lighting, Power and Railway Plants.
Telephone, 2730 John

Great Falls, Mont.—Contract for steel storage standpipe 40 feet diameter by 60 feet high to Chicago Bridge and Iron Company at $11,713.

Halstead, Minn.—Contract for water works system to W. D. Lovell, Des Moines, Iowa, at $7,735.

Jersey City, N. J.—Reported to have awarded contract for new water mains to J. R. Shanley, at $107,667.

Jola, Kan.—Contract for concrete and brick settling basin to Hanley and Ritchie, City, at $12,048.

Kansas City, Mo.—Contract for centrifugal pumps for Quinardo pumping station to Quincy Engine Works, Quincy, Ill., at $13,900.

New York City, N. Y.—Contract for machinery for Croton dam to Coldwell-Wilcox Company, Newburg, N. Y., at $87,320.

Ovid, Mich.—Contract for steel tower addition to W. E. Caldell, Louisville, Ky., at $2,000.

Philadelphia, Pa.—Contract for 17 double sand washers, at $13,095 and 65 sets of ejectors, at $20,015, to E. M. Nichols.

Port Townsend, Wash.—Contract for Olympic gravity water system to Jacobsen, Bade and Company, Portland, Ore., at $244,000.

Seattle, Wash.—The following contracts let: Water main in Roy street to P. McHugh, at $18,222; Fifty-second street, at $1,842.30, and Latonia avenue, at $20,531.25, to Pacific Coast Pipe Company; Colorado street to McLellan and Company, at $8,605; Fifth avenue west to Prospect street to Puget Sound Bridge and Dredging Company, at $4,966.

Smith Center, Kan.—Contract for water works to Conklin and Gustafson, Topeka, at $24,000.

Toronto, Ont., Can.—Contract for laying new intake water main from Lake to McQuillan, Toronto, at $19,000.

Wheeling, W. Va.—Contract for 30-inch water main to Koehnline, Castoe & Warner, at $75,000.

Winfield, Kan.—Reported to have awarded contract for water works to Burns and McDonnell, Kansas City, Mo., at $89,000.

FIRE DEPARTMENT SUPPLIES

Altoona, Pa.—Plans have been adopted for the erection of a fire station.

Charleston, W. Va.—Plans have been accepted for the erection of two fire stations to be built of brick.

Columbus, O.—$28,000 will be appropriated for the erection of new South Side fire stations.

Jackson, Miss.—Plans are being prepared for a $10,000 fire department building to be built of brick.

Kansas City, Mo.—City will buy a $5,000 fire engine.

Lansing, Mich.—Bids are being received for new fire engine station.

Los Angeles, Cal.—Bids are wanted for two fire engines and a ladder truck.

Marietta, O.—Fire department needs chemical engine, fire hose, ladders, coats, etc.

Milwaukee, Wis.—Plans are being prepared for a $75,000 fire boat. Bids will be wanted about December.

Minneapolis, Minn.—A new engine house will be erected in milling district.

Newark, N. J.—Will advertise for aerial truck and a combination hose and chemical wagon.

New Haven, Conn.—New engine house will be erected.

Norfolk, Va.—The Improvement Board of the 7th ward has appropriated $1,500 for a chemical engine.

Park City, Utah.—A committee of volunteer firemen has been appointed to consider the purchase of three small chemical engines.

Pewaukee, Wis.—Will erect a $3,000 fire engine house.

Rochester, N. Y.—Will buy water tower and install new fire alarm system.

Schaunberg, Ill.—Will buy new hose, hook and ladder and other apparatus and will erect town hall and engine house combined.

Sebastopol, Cal.—Bids are wanted for a fire engine. Mayor Overton.

Tuscombia, Ala.—Will purchase a chemical engine.

(Continued on page 29.)

THE BEST MUNICIPAL BOOKS

Sewers and Sewage

SEWAGE AND BACTERIAL PURIFICATION OF SEWAGE. Methods of disposal, etc. Samuel Rideal, D.Sc. (English.) 278 pp. $3.50.

SEWERAGE. Design, construction and maintenance of sewer systems. A. Prescott Folwell. 445 pp., illus. $3.00.

SEWAGE DISPOSAL. Methods of disposal and purification. Wyncoop Kiersted. 182 pp. $1.25.

SEWER DESIGN. Treatise on sewer construction. H. N. Ogden. 234 pp., illus. $2.00.

SEWERS AND DRAINS FOR POPULOUS DISTRICTS. Rules and formulas for dimensions and construction. J. W. Adams. $2.50.

PURIFICATION OF SEWAGE. Scientific principles of sewage purification and their application. Sidney Barwise. (English.) Illus. $2.00.

CLEANING AND SEWERAGE OF CITIES. Translated from the German. R. Baumeister. Illus. $2.00.

SEWAGE WORKS ANALYSES. Methods of analysis used in laboratory of Manchester Sewage Works, England. Gilbert J. Fowler. 128 pp., illus. $2.00 net.

PURIFICATION OF SEWAGE AND WATER. W. J. Dibdin. (English.) 3d Edition. Illus. 379 pp. $6.50.

SEWAGE DISPOSAL IN THE UNITED STATES. G. W. Rafter and M. N. Baker. Illus. $6.00.

SEPARATE SYSTEM OF SEWERAGE. Theory and construction. Cady Staley and G. S. Pierson. Illus. $3.00.

SEWERAGE AND LAND DRAINAGE. Geo. E. Waring, Jr. Illus. $6.00.

MODERN METHODS OF SEWAGE DISPOSAL FOR TOWNS, PUBLIC INSTITUTIONS AND HOUSES. Geo. E. Waring, Jr. Illus., 260 pp. $2.00.

SEWERAGE AND SEWAGE PURIFICATION. M. N. Baker. 50 cents.

THE TREATMENT OF SEWAGE. Dr. C. Meynott Tidy. 50 cents.

ELEMENTS OF SANITARY ENGINEERING. Mansfield Merriman. 222 pp. $2.00.

Roads and Pavements.

HIGHWAY CONSTRUCTION. Treatise on construction and maintenance of roads, streets and pavements. A. T. Byrne. 895 pp., illus. $5.00.

TEXT-BOOK ON ROADS AND PAVEMENTS. Country roads and city streets. F. P. Spalding. 213 pp., illus. $2.00.

STREET PAVEMENTS AND PAVING MATERIALS. Methods and materials of city street construction. George W. Tillson. 496 pp., illus. $4.00.

ROADS AND PAVEMENTS. Paving materials and pavement construction. Ira Osborn Baker. 600 pp. Illus. $5.00.

CITY ROADS AND PAVEMENTS. William Pierson Judson. 186 pp., illus. $2.00.

ROADS: THEIR CONSTRUCTION AND MAINTENANCE. Special reference to road materials. Allen Greenwell and J. V. Elsden. (English.) 280 pp., illus. $1.50.

ECONOMICS OF ROAD CONSTRUCTION. A short practical treatise. Herbert P. Gillette. 41 pp., illus. $1.00.

PRACTICAL TREATISE ON THE CONSTRUCTION OF ROADS, STREETS AND PAVEMENTS. Gen. Q. A. Gilmore. Illus. $2.00.

NEW ROADS AND ROAD LAWS IN THE UNITED STATES. Gen. Roy Stone. Illus. $1.00.

MUNICIPAL JOURNAL PUBLISHING COMPANY,
253 BROADWAY, NEW YORK.

See other lists elsewhere.

We will supply any book in print at regular price.

CONTRACTS AWARDED

Janesville, Wis.—Contract for fire station awarded to Blair and Summers at $2,155.

New York City, N. Y.—Contract for altering and repairing building for Engine Company 44 on East Seventy-fifth street, to George Hildebrandt, at $20,596; for altering and repairing house of Engine 50, at 166th street and Third avenue, to William Wright and Son, at $26,981. Contract for new fire house to take the place of one at Chambers and Center streets, to Walters and O'Connell, at $72,872.

Schenectady, N. Y.—Contract for number 4 hose house, to Hanrahan Brothers, at $8,497.

SALE OF MUNICIPAL BONDS

Aberdeen, Miss.—On October 5, $70,000 water works and sewage bonds will be sold. J. M. Allen, Mayor.

Carrollton, Ga.—On October 15, $45,000 water, sewer and electric light bonds will be sold. E. B. Merrill, City Clerk.

Duluth, Minn.—On October 7, $100,000 school bonds will be sold. C. A. Bronson, Clerk Board of Education.

East St. Louis, Ill.—On October 3, $125,000 Union School District 10 bonds will be sold. J. J. Reader, Secretary Board of Education.

Harrison, N. J.—On October 4, $250,000 street improvement bonds will be sold. Town Clerk.

Ligonier, Ind.—On October 13, $17,000 water bonds will be sold. R. E. Jeanneret, City Clerk.

Lorain, O.—On October 3, $106,000 street paving and $21,000 sewer bonds will be sold. J. J. Mahony, City Auditor.

Muskogee, I. T.—On October 3, $100,000 water and sewer bonds will be sold. W. W. Momyer, City Recorder.

San Francisco, Cal.—On October 3, $250,000 hospital, $724,800 sewer, $1,077,000 school, $243,000 street, $278,400 jail and hall of justice, $739,800 library, $740,000 playground, $328,000 Golden Gate park, $292,000 Mission park bonds will be sold. C. W. Fay, Clerk Board of Supervisors of City and County of San Francisco.

Youngstown, O.—On October 3, $13,000 improvement and $1,500 crosswalk bonds will be sold. Wm. I. Davies, City Auditor.

SPECIAL BOND ELECTIONS TO BE HELD

Clyde, O.—On October 8, $8,400 water works bonds will be sold. Chas. F. Hurd, Village Clerk.

Lambertville, N. J.—On October 10, $25,000 street improvement bonds will be sold. City Clerk.

Lexington, Ky.—On November 8, $100,000 sewer bonds will be sold. J. E. Cassidy, City Clerk.

Maysville, Ky.—On November 8, $12,000 sewer bonds will be sold. J. L. Daulton, City Clerk.

Muscatine, Ia.—On October 10, $60,000 water bonds will be sold. City Clerk.

Newport, Ky.—On November 8, $90,000 municipal lighting plant bonds will be sold. City Clerk.

Rankin, Pa.—On November 8, $49,000 improvement bonds will be sold. Borough Clerk.

Seattle, Wash.—On November 7, $800,000 city hall and jail bonds will be sold. City Controller Riplinger.

MISCELLANEOUS

Baltimore, Md.—Ordinance has been passed appropriating $4,500,000 for public works. $3,000,000 of it is to be used for new docks and widening Pratt street.

(Continued on page 30.)

W. H. SCHOTT
ENGINEER
Marquette Building
CHICAGO
Designer and Builder
CENTRAL STATION
HEATING, GAS,
ELECTRIC LIGHT
and POWER PLANTS
STREET RAILWAYS FINANCED AND BUILT COMPLETE

Contractors' Equipment Company
BETZ BUILDING,
PHILADELPHIA.
Steam Road Rollers, Road Machines, Crushers, Sprinkling, Sanding, Dump and Distributing Wagons, Road Making and Contractors' Plant of every description. Our list for the asking. Correspondence solicited.

W. R. CONARD
Inspector of Iron Castings
Including: Building, Bridge and Sewer Castings, Valves and Hydrants.
SPECIALTY: Water and Gas Pipe and Specials for same.
1004 High Street, Burlington, N. J.

JOSEPH G. POLLARD
CONTRACTORS' SUPPLIES
141 Raymond Street
BROOKLYN, N. Y.
Tools for Sewer Construction and Pipe Laying a specialty
Best material and workmanship
Write for catalogue

U. S. MAIL CHUTES
The Cutler Patent Mailing System installed by the Sole Makers.
THE CUTLER MFG. CO., Rochester, N. Y.

D. P. REGAN & MULOCK
Electrical Subway Contractors
4402 Chestnut St., Phila., Pa.
and Atlantic City, New Jersey
More than 14 Years' Experience Exclusively in this Line in Europe and America.

PATENTS
promptly obtained OR NO FEE. Trade-Marks, Caveats, Copyrights and Labels registered. TWENTY YEARS' PRACTICE. Highest references. Send model, sketch or photo. for free report on patentability. All business confidential. HAND-BOOK FREE. Explains everything. Tells How to Obtain and Sell Patents, What Inventions Will Pay, How to Get a Partner, explains best mechanical movements, and contains 300 other subjects of importance to inventors. Address: H. B. WILLSON & CO., PATENT ATTORNEYS.
871 F STREET, N. W., WASHINGTON D. C.

Southern Creosoting Company, Ltd.
SLIDELL, LOUISANA.
Located in the finest Long Leaf Yellow Pine District in the United States. Capacity 22,000,000 feet B. M. per annum.

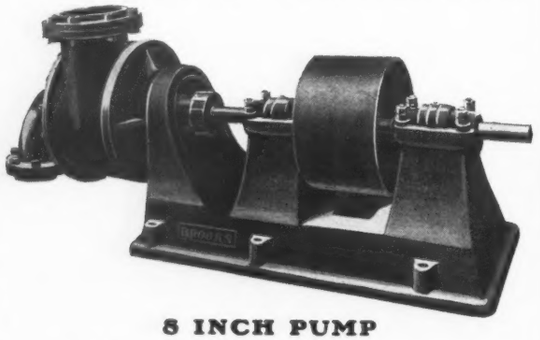
IN A CLASS BY ITSELF

BROOKS CENTRIFUGAL PUMP

BEST MUNICIPAL PUMP MADE.

Our Guaranty

GREATEST VACUUM (28½ in.)
GREATEST PRESSURE (60 lbs.)
GREATEST EFFICIENCY
Of any Centrifugal Pump in the World



8 INCH PUMP
CAPACITY, 120,000 GALLONS PER HOUR
WEIGHT 1200 LBS. SUCTION 31 FT.
PRESSURE 60 POUNDS
2 STAGE COMPOUND 105 POUNDS

We make Pumps of all sizes and to meet all conditions

Manufactured Exclusively by
Wm. H. Cook & Co.
MONADNOCK BUILDING
CHICAGO, ILL.

Bloomington, Ill.—Plans will be prepared for a public park pavilion, to cost $15,000.

Brockton, Mass.—Will enlarge sewer filter beds. Estimated cost of doing same is $10,000.

Brooklyn, N. Y.—Considering laying out the following: Park to be bounded by Eastern Parkway, Broadway and Somers street; park to be bounded by Eastern Parkway, Washington and Grand avenues.

Chicago, Ill.—Bids will be wanted soon for new superstructure for Lake View Pumping Station crib, at $65,000.

Des Moines, Ia.—Considering the erection of a garbage crematory. James E. Miller, City Physician.

Hornellsville, N. Y.—Will probably erect a garbage crematory.

London, Ont., Can.—May install a garbage crematory.

Newport, R. I.—Will put a fence around Morton park.

Marion, O.—Plans are being prepared for a garbage disposal plant.

New York City, N. Y.—Municipal Arts Commission has approved plans for two isles of safety for Long Acre square, at an estimated cost of $10,000 each.

Sebring, O.—Passed a resolution for the establishment of a sanitary sewer system and disposal plant, estimated at $47,000.

Trenton, N. J.—Will buy site for garbage crematory.

West Point, N. Y.—Bids are wanted October 6, for Corliss engines, generators, motor generators and switchboard.

Wichita, Kan.—Bids are wanted for improvement to Riverside park.

CONTRACTS AWARDED

Coldwater, Mich.—Contract awarded for sewerage disposal plant to Theodore W. Hill, Toledo, O., at $5,036.

Columbus, O.—Contract for sewerage disposal plant pumping station to Samuel A. Esswein, at $46,500.

Dansville, N. Y.—Contract for sewerage disposal plant and part of sewerage system to Eveline and Baltimore, Corning, at $78,000.

Elmira, N. Y.—Council Committee recommends that garbage reduction plant contract be let to Clinton Foundry and Machine Company at $16,277.

Fort D. A. Russell, Wyo.—Reported to have let contract for garbage disposal plant to Chas. F. Hendrie, Denver, Colo., at $8,200.

CITY ROADS AND PAVEMENTS

William Pierson Judson, C. E.

This work is especially adapted to the paving conditions in cities of moderate size. It has run through one edition and the second has been improved by showing the present practice in road paving as it differs from that in vogue in 1894. The author reviews the subject of pavements since early times, coming down to modern pavements as regards their cost, formation, drainage, etc. A chapter is devoted to concrete base for pavements and asphalt, brick, wood, block, bitulithic and broken-stone paving are the subjects of other chapters. The work is well illustrated with half-tone cuts and line-drawings and there are valuable tables. Cloth, 186 pp., $2.00